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CONSOLIDATED, MOGUL AND EIGHT-WHEEL FREIGHT-ENGINES.

BY FRANK C. SMITH.

[Written for the AMERICAN RAILROAD JOURNAL.]

OF late years in this country the consolidated and mogul types of locomotives for freight-service have largely displaced the ordinary eight-wheel or American type of engine. It was argued in their behalf that as they would pull from a half more to twice as many cars as the eight-wheel engine, marked economy would result in the saving of engineers', firemens', conductors' and train-hands' wages. If, when these heavy engines were adopted, the framing and especially the draft-rigging of freight-cars had been strengthened in proportion as the trains were enlarged, a large drawback for repairs to these parts, damages for injured freight caused by cars being side-tracked on the road and left on account of having the "whole end pulled out," would not have decreased and in many cases have entirely over-topped the saving in wages, etc. With the advent of these heavier engines came the increasing of the capacity of cars with the "marking brush." That is, cars built and marked to load to 10 or 12 tons, were made capable of hauling 15, 16 and 18 tons. Thus the enlarged trains, with the heavier loads per car, aided in racking and destroying many thousand of very serviceable cars.

Another offset to the claimed economy of these heavy engines arose from the fact that on many roads for but short portions of the year could sufficient cars be found to make a proper load for them. That is, in many cases freight would fall off so that but from 15 to 20 cars would be ready for a train, and as these heavy engines cost from ¾ to 1½ cents per mile more for fuel, and from 1 to 2 cents per mile more for repairs, another item to offset their economy arises. In addition to this they are much harder on curves, frogs, switches, etc., not because they have more weight per wheel than the eight-wheel engines, but because the gross weight, or the weight per foot of the length of the engine, is greater, and to correct this it was on many roads found necessary to reduce the speed per hour from 15 or 20 miles to 10 or 12.

Experiments have been made to determine the friction of the eight-wheel, ten-wheel and consolidated type of engines in passing around curves, by hauling them dead, behind a dynamometer-car, with the result of showing that the eight-wheel engine required a pull of 1,963 pounds, the consolidated 1,850, and the ten-wheel 1,750 pounds. It was objected that this was not a fair test, inasmuch as the action of an engine *propelling itself* and being hauled was widely different, and this is undoubtedly the case, as there should be no difference between an eight and ten-wheel engine, of the same total wheel-base, provided the leading pair of drivers of the ten-wheel engine are "blind" or without flanges. But, as before stated, the destructive features of the different classes of engines is to be found in their weight, as it is plain that an engine weighing from 5 to 10 tons and upwards more than another, must necessarily tend to straighten out a curve more, both striking it at the same speed.

The average mogul engine in use in this country has 18×24-inch cylinders with about 66,000 pounds on the six drivers, or 11,000 pounds per wheel. The design of the mogul grew out of the supposed limit per wheel of 12,000 pounds, it being believed that to exceed this would cause the wheel to crush into and destroy the rail. But like many other popular beliefs a little practice dispelled it, since the limit per wheel has largely increased, as the Pennsylvania road is using 16,250 pounds per wheel, the Reading road 17,000 pounds, and 22,000 pounds per wheel has and is successfully used as a shifting engine. It appears from this that an eight-wheel engine may be built having 17,000 or 18,000 pounds per wheel, with the same size of wheel and cylinder, and thus be as powerful as a mogul of the same size, with the additional features of being cheaper to build at first cost, cheaper to keep up, and cheaper for fuel. Of what necessity, then, is the mogul engine, since if the tractive force due to 18 or 19 inch cylinders is sufficient for all present needs of our roads, the weight per wheel on an eight-wheel engine will not prove injurious to modern rails. In proof of this I may cite the case of a road which had been stocked with comparatively light engines—10,000 pounds per wheel. In the course of time, this road absorbed several branches and built others, which were in a much more level section of country than the original or main line. The light main line engines were sent on these divisions, and their places filled with heavier engines having 16,000 and 17,000 pounds per wheel. The result was that the track and tires showed much less wear, this being due to the decrease of the imperceptible slip which is going on constantly between the wheel and rail. That the decrease of imperceptible slipping accounted for this correctly cannot be doubted. The writer, to determine the amount of slipping, placed a revolution counter on a 17×24 eight-wheel freight-engine. The distance the engine would advance by one revolution of the drivers was ascertained by marking the tire and rail when the tire rested on the rail. The engine was then pushed ahead until the mark came fair to the rail again, and the rail marked. The distance on the rail between these two marks gave the distances the engine moved in one revolution. The engine was then coupled to a train and run over a measured piece of track 12 miles long, and not a perceptible slip occurred in the 12 miles. The distance the engine should have advanced, found by multiplying the number of revolutions shown by the revolution-counter by the distance moved in one revolution, gave 13.8 miles, thus

proving that an imperceptible slip of 1.8 miles had occurred while the engine had actually moved but 12 miles. And it may be taken as a fact that all engines having but this proportion of weight to the cylinder slip imperceptibly a similar amount. No one would question the great wear which would occur if the wheels of an engine were chained to the frame and prevented from revolving if the engine were towed by another, and this amount of wear, if distributed over the whole surface of the tire instead of being confined to one spot as in the case supposed, would be exactly similar in amount to that which would result if the wheels revolved twice as fast as the engine moved. While this never occurs in practice, it undoubtedly occurs to from ten to twenty per cent. of this amount.

As has been already stated, to prevent the heavy consolidated engines from injuring the track, etc., it is necessary to reduce their speed to 10 or 12 miles per hour. Professor Dudley's experiments have shown that 18 miles per hour is more economical than 10 or 12 miles per hour so far as fuel is concerned; but the question may arise as to the cost of repairs to cars at higher speed. In answer to this, the record of the Cincinnati, New Orleans and Texas Pacific Railroad shows, that the repairs to their fruit-cars—which are ordinary box freight-cars fitted with ventilators—run in a special train at a speed of 25 miles per hour, show no increase over those of the ordinary freight-cars which run at 10 to 15 miles per hour. It, therefore, would appear that the eight-wheel engine having 18 × 24-inch cylinders and 59 to 60-inch driving-wheels, with from 17,000 to 18,000 pounds per wheel, were the most economical engines for freight-service for all ordinary uses; for this type is cheaper at first cost, costs less per mile for fuel, less per mile for repairs, can be run at higher speeds with less injury to the track, curves, etc., and its adhesion and tractive force is equal to that of the mogul of the same size.

In this connection it may be well to cite the report of some experiments made on the Boston and Albany Railroad to determine the comparative advantages of the mogul and eight-wheel types of engines. The mogul was named "Brown," the eight-wheel engines the "Virginia" and "Adirondack." The cylinders of all the engines were of the same size—18 × 26 inches—the dummy wheels were all of the same diameter—4 feet 6 inches—except those of the "Virginia," which were 5 feet. The boilers differed in these particulars: The furnace of the "Brown" was 65¾ inches long, 35 inches wide and 56½ inches high; tubes 162, 2 inches diameter, 11 feet 4 inches long. Those of the "Adirondack" and "Virginia," 54 inches long, 41½ inches wide and 51½ inches high; tubes 162, 2 inches diameter and 11 feet 10 inches long. So it will be seen that as to the area of the grate there were 60 square inches of difference in favor of the "Brown," and 42 square feet in the flues in favor of the "Virginia" and "Adirondack." The weight of the "Brown" is 73,000 pounds, with 55,200 pounds on the drivers; the "Virginia" and "Adirondack," 67,150 pounds, with 43,000 pounds on the drivers. On the first trial between the "Brown" and "Virginia," five round-trips were made between Greenbush and Pittsfield; 105 full loaded line-cars were taken east, and 175 (a large number of which were empty) were taken west by each engine. The fuel consumed by the "Brown" was 30,850 pounds of coal, costing $107.93; by the "Virginia," 23,924 pounds of coal, costing $83.73. On the second trial between the "Brown" and "Adirondack," nine round-trips were made between Springfield and Boston; 224 cars, less 24 from Worcester to Boston, were taken east, and 320, less five from Worcester to Springfield, west by the "Brown;" and 223 east and 307, less three from Worcester to Springfield, west by the "Adirondack." The fuel consumed by the "Brown" was 106,150 pounds, costing $371; by the "Adirondack," 83,090 pounds, costing $290. The average time upon the trial was, going east to Charlton Summit, 1 hour and 4 minutes in favor of the "Adirondack," and from Boston to the same point, 1 hour and 39 minutes in favor of the same engine. On the third trial between the same engines, 14 round-trips were made between Greenbush and Pittsfield; 317 full loaded cars were taken east and 387 west by the "Brown," 317 east and 372 west by the "Adirondack." The fuel consumed was 86,148 pounds by the "Brown," costing $301.54; and 69,676 pounds by the "Adirondack," costing $226.36. Thus it will be seen that in 37 days' trial the mogul burnt 225,148 pounds of coal, costing $790.54; and the eight-wheel engines 176,690 pounds, costing $600.11; showing in favor of the latter a saving of 48,458 pounds of coal, or $190.43. This seems to be very conclusive.

ENGLISH AND AMERICAN RAILWAYS.

BY W. E. PARTRIDGE.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE August number of *Harper's Magazine* contains an article on English and American railways which is ostensibly an analysis of the systems employed in the two countries. The social and economic sides of the subject are fairly discussed, though the author shows rather greater familiarity with the principles and social customs of the English than the American system. The observations are in the main correct and conclusions justly drawn. The illustrations are, as is usual with *Harper's*, very good, if we except the pair which are devoted to American railways. That the sketch of the interior is imaginary, is proved by a curious uniformity in size of all the figures, as well as by certain rather amusing blunders in perspective and mechanical detail.

Although the subject, treated from a popular point of view, permits of little technicality in connection with mechanical matters, that little should be correct. Unfortunately the author is decidedly "off the irons" in this department of his subject.

In the statement that the American car consists of one compartment the entire length of the vehicle, and the English of several compartments of its entire width, the author misses completely the characteristic distinction between the cars used in the two countries, while at the same time he asserts what is not true.

American car-wheels he speaks of as "small, solid looking," and twice calls them "wide-flanged," apparently ignorant of the fact that a vast number of American cars have the same size of wheels as the English, and that flanges are no wider in America than in England.

Because a high speed is attained within 500 yards the tractive force is supposed to be extraordinary. The effect of a lighter train is not, of course, considered. The cab, the bell and the pilot each receive a word, and misinform-

ation is given in regard to each. The latter is called a "cow-destroyer." Had the author ridden much upon American roads at night his remarks upon the powerful head-light used in this country would have been materially altered.

The character of the praise bestowed upon English car-wheels betrays an ignorance of their weaknesses as well as of the best points of car-wheels generally.

The American system of checks is mentioned and some of its advantages enumerated. In pointing out the objection to the introduction of such a system in England, the author evidently supposes the "baggage-express" a part of the check system. The system of checks is quite as applicable to the English as to the American method of traveling. It is applicable alike to the coat-room, the luggage-van, the depot, or the hotel. While the baggage-express may not be suitable for the English traveler, the check system of identifying and receipting for baggage is applicable in any place where baggage is carried in charge of companies' servants or deposited for safe-keeping.

On the question of class the author makes the standard blunder in supposing that first, second and third-class do not exist in America. On nearly all American roads there are at least three distant classes and on some four. A few roads make distinctions which entitle them to five classes. The normal ticket of the country is usually called first-class on its face. It is not so, however, by any means. Below this comes second-class which only entitles the holder to ride in the smoker or some other second-class car. Third-class is often the emigrant class. The so-called first-class ticket differs from the two classes below it in that the passenger may travel first-class if he chooses, and must hold such a ticket in any event if he wishes to go first-class on ordinary trains; with lower class tickets the ticket itself must be changed to secure a first-class passage. The first-class on ordinary trains is the parlor or sleeping-car passenger; he, of course, holding a double ticket. The really first-class, however, is to be found on the limited trains, where, as in the palace-car, the passenger usually holds a double ticket. The classes in America, then, may be enumerated thus: limited, parlor, first (or common), second and third (or emigrant). Four of these are widely recognized; second and third are frequently merged in one, and, of course, there are many lines that do not run "limited" trains. The general practice appears to be so uniform as to bear out the assertion that at least four classes are recognized in America. Bearing these facts in mind it is easy to see how far astray the author goes in asserting that the so-called first-class of America is the English third-class. It more nearly approaches the second, but is essentially different from any class known abroad.

The discussion of speed of trains is very unsatisfactory. There are a few fast trains in this country and many in England. Long journeys and short, however, must not be taken for comparison. Nor is it fair to compare trains between New York and Boston which make many "know-nothing" stops, with express-trains in any part of the world.

An examination into the differences between English and American railway practice is both interesting and instructive. The facts are frequently lost sight of by those who should be perfectly familiar with them.

The radical difference between an English and an American car is that the English car is entered from the sides and the American car from the ends. The internal arrangement has no significance. The English car of to-day is what the cars of both countries were in the beginning—a series of coach-bodies placed on a frame. The American car is no longer a coach-body. Convenience of exit and of internal arrangement have been sacrificed to the necessity of strength and safety. Cars built with continuous sides and frames in the American style go without material injury through accidents which would completely wreck cars framed on the English system. The difference in strength is not due to a difference in weight, but is structural. Baggage-cars, which are far more strongly framed than passenger-coaches, are more easily wrecked on account of their side-doors. The continuous truss along the side of a passenger-coach is invaluable for its resisting power. Thousands of accidents are considered trivial which, with cars having side doors, would be slaughters. Notably the accident some years ago at Wollaston, Mass., which was very fatal. Two English cars in the train went completely to pieces, causing a large part of the loss of life. About the same time an accident occurred to the "Chicago Limited," which was quite as severe mechanically, which did not reach the daily papers. A train at about 50 miles per hour ran out of an open switch, across a freight-yard. The cars were scattered about but no person was hurt except the express messenger, whose car had its end crushed. The passengers were saved by the strength of the cars alone.

Desirable as side doors are, it does not appear probable that accidents will ever become so few in number as to make them safe or prudent. Loss of life in accidents is small so long as the cars are intact. If they break up, a trivial accident will usually cost many lives.

In the character of the car-wheels employed, English and American practice once differed very widely. The 33-inch cast-iron wheel was, at one time, almost universally used in this country for both passenger and freight-service. The advantage of a larger diameter has long been felt, and with the introduction of the paper and other cushioned wheels, the English size of 42 inches has been largely adopted. The passenger usually attributes the smoothness of running, gained by the large wheel, to an improved condition of the track. This mistake is quite natural as the car with large wheels is no higher than the others, and the wheels do not show. Such wheels need larger axles than those commonly used for them.

Formerly one of the distinctive features of the American railway system was the truck. This is perhaps the most difficult piece of mechanism to understand, and this is probably the reason why its use has spread so slowly abroad. Its advantages are bringing it into use on many English engines as well as cars. In the earlier efforts to copy our trucks, the principle of the equalizer was missed entirely, and even now the swing beam frequently lacks those qualities which give it any structural advantage.

Elasticity and flexibility are quite as valuable on perfect road-beds as on the most defective. The destruction of rigid and flexible rolling-stock on a perfect road has but recently received attention. Investigation of the subject is causing the adoption of American ideas abroad, and we may expect before many years to see foreign practice closely assimulating the American in respect to elasticity and flexibility of rolling-stock. The adoption of a style

of car having numerous side-doors, as on many of the Coney Island roads, can only be looked upon as a dangerous step backward, which is liable to make a run off or an upset the occasion of a calamitous loss of life. We may, therefore, conclude that as long as one of the leading ideas of American railway management is safety, the side-doors will be left to the use of nations which make a greater protestation while they have little real care for for the safety of their railway passenger.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
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[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

III. THE MISSOURI PACIFIC RAILWAY.

THE medical department of the Missouri Pacific Railway, together with the Texas and Pacific Railway, was established in 1879, and is administered by a chief surgeon at St. Louis, three assistant chief surgeons located at Sedalia, Mo., Atchison, Kans., and Fort Worth, Tex., and 128 local surgeons at the most important points of the system, about 60 miles apart. These last are employed under contract, according to an established fee-bill, and their services are required chiefly in emergencies and in case of such injuries and ailments as do not need removal to hospital. There are already hospitals in operation at St. Louis and Sedalia, Mo., Fort Worth and Marshall, Tex. A fifth is under construction at Palestine, Tex., and a sixth will soon be erected at Atchison, Kans. Each hospital has two house surgeons and a druggist, and Sisters of Mercy are employed as nurses.

The hospital department is distinct from all others in its control and accounts. Its expenses are met by deductions from the monthly pay of all employés, at the rate of 25 cents per month on wages of $100 and less, and 50 cents on wages of more than $100 per month. Sick and injured employés are furnished with certificates of disability by a foreman, approved by the head of the department, except in case of emergency; also passes to the nearest company hospital, where they are entitled to medical attendance, medicines and maintenance. Cases of venereal disease are not admitted.

All expenses incurred for treatment and transportation of injured employés prior to admission are at the charge of the company, and in case of death from injury the company defrays the cost of burial.

Hospital surgeons report monthly to the chief surgeon. Their reports state the number of patients admitted, discharged, dead and remaining under treatment; a classification of inmates according to their branch of service, age and social condition; injury or ailment of those admitted; number of prescriptions for in-patients and out-patients; an account of laundry work done and of meals supplied; an ambulance exhibit of patients transported to hospital; and a roster of hospital employés. Local surgeons are required to make a special report of every case of injury that falls under their hands, covering no less than twelve different points of inquiry, and accompanied, when necessary, by an anatomical diagram to illustrate the nature of the injury.

In 1885 a system of sanitary inspections was instituted, having reference to buildings and grounds belonging to the company. Separate blanks are provided for reports upon the sanitary condition of station-houses, section-houses, shops, etc., with grounds attached, covering eighteen points of inquiry. Moreover, quantities of disinfectants and deodorants have been supplied, with instructions for their use. Five hundred and eighty of these reports have already been rendered, and nearly $1,200 have been expended for disinfectants and sanitary work.

Very encouraging results have been obtained from the first season's trial of this new feature. Besides, the water at various stations has been subjected to chemical analysis, and it is contemplated to issue a tract of instructions to employés for selecting and using drinking water. In the event of the appearance of cholera, printed instructions will be distributed for guarding against this disease. It is designed shortly to issue a report on endemic diseases, to instruct employés how to protect themselves against local insanitary conditions. This systematic work for the prevention of disease is an important advance in the right direction and is sure to bear more beneficial fruits, in proportion to cost, than any other branch of the medical service, for its extra cost must be trivial, and the data furnished will show precisely what sanitary improvements are needed.

No provision is made for extending medical relief to the families of employés. This is a very desirable feature, for a large proportion of the men are married, and their families might be included in its benefits without any great increase in the expense of the service. Such cases would be exclusively medical and would be treated at home or at the doctor's office. Medicines would be at the expense of the family if no fund were available. A free pass over the road for a limited distance in either direction would go far, perhaps completely, to compensate the local surgeon for the extra service, and the company would not feel this burden. A small additional assessment on the wages of family men would supply any deficiency.

No physical examination of employés is made to test their general soundness of health or the integrity of their organs of sight and hearing. This measure should be adopted, not merely for the safety of trains but also for a guarantee to the hospital fund against undue burdens. The hospital department of the company is a mutual benefit association, the fundamental principle of which is equalization of contributions, risks and benefits, according to the lights of experience. Physical unsoundness disturbs the just equilibrium and is sure to make the institution a pauper asylum for a number of individuals who might be sifted out by a preliminary medical examination.

Cattle-cars are disinfected after use, but owners and shippers of live animals are presumed to be properly governed by their own pecuniary interests so as to avoid subjecting them to undue hardship in transportation. Experience shows this to be a supposition not justified by experience. Undoubtedly control and supervision are demanded, not only as a guarantee to future consumers but as an adequate safeguard against loss to the present owner. It is simply a question whether the control should

be provided by the state or by the company. Suitable rules might be framed by the medical department and carried out effectually by the operating department without invoking legislation, but it is clear that the latter will sooner or later be demanded by the public, in case of continued neglect by railway companies.

The foregoing criticisms apply to most of the railway companies in this country, and consequently have no peculiar application to the one now in question. These provisions are strictly carried out upon the railway lines of France and most other countries of continental Europe, and must eventually be adopted by the leading companies of this country.

In closing this article, I would acknowledge my indebtedness to Dr. W. B. Outten, of St. Louis, chief surgeon of the company, who has kindly supplied the necessary data.

PIECE WORK IN THE RAILWAY PAINT-SHOP.

BY F. S. BALL.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

HAS piece work any advantage over day work? We hold that it has. Day work is a contract to pay a specified sum or compensation for a certain number of hours per day of labor, or a moiety thereof per hour. The amount of labor to be done does not usually enter into the contract, and is as variable as the will and ability of different workmen and the varied qualifications and executive abilities of the master painters can make it. Piece work is a contract to do a stated amount of work, as per certain specifications, for a stipulated sum of money, and is invariable for all jobs of like character or class, which is not the case when labor is paid by the hour. Wherever it has been adopted, an increase of one-third more work and a reduction of cost in like ratio, without any increase of working force, together with an increase of earning power to the employé, has been the result. The following are some of the advantages to the employer, in addition to those referred to above: Protection from loss by reason of damage caused by carelessness or want of skill on the part of the workmen, the damage having to be made good at his own expense, all operations being inspected by the foreman in charge, when reported finished, and credit allowed only when satisfactorily performed, the foreman being the judge. It enables the foreman to determine the qualifications of each new employé more readily than under the day system, as under that system the slow and unskillful man is usually screened and assisted by those with whom he works, while under the piece work system each man in relation to the employer is an individual contractor and in limited partnership with relation to his fellow-workmen, and is not disposed to divide his earnings with any who are not as skillful and fully as able to earn their share of the proceeds of their joint labor. Hence he will object to the retention of any such as may be unwittingly employed, because, also, he becomes as a partner responsible for and must assist in repairing any damage occasioned by such unskillful or careless workman. It secures to the company the services of good workmen. Where shops are located at isolated points, at a distance from business centers, and employment at those shops are the only means of support available to the men except at the expense of moving away, much difficulty is usually experienced, at a time of a sudden influx of work, to obtain any increase of the working force, unless exceptionally high wages are offered; the reason being that men are not inclined to accept a job at such points on account of probable fluctuations in the work to be done, and the trouble and expense entailed, in case they should lose their job in a short time, in seeking work elsewhere, But piece work, in allowing increased earning power to a definite number of hands for a length of time in each year, which can be averaged, say nine months, compensates for the enforced idleness of the other three, and much of this may be made up on odd jobs outside of the company's employ, besides insuring steady employment to that number, and obviating the necessity of any reduction of the working force, except at times of the most extraordinary business depression; and any increase of business or work can be met by an increase of the hours of labor, or overtime, without increasing the number of hands; hence the men finding that their average wages the year round are as much as they can earn elsewhere, are not disposed to change for every trifling or temporary advantage offered them. It relieves the foreman of the immediate oversight of the men and transfers it to the results of their labors alone, enabling him to devote more time to the perfecting of methods and details of shop management, and to the investigation of such questions relative to car and locomotive-painting as are continually arising. It in a measure divides the responsibility, or, rather, furnishes him a means of self-protection against carelessness on the part of the workman, without resultant loss to the company, or the no less disagreeable alternative of disciplining by suspension or discharge. It is self-adjusting as to the relations of the employé with the company and one another, on a strictly business basis, because the skillful and industrious will naturally desire to work with those who are equally so; and where skill is not required, industry is the standard, and all who are unable or unwilling to meet the requirements must give place to those who can, for the reasons before stated. The advantages to the workmen are also important. The intelligent and skilled workman is enabled to reap the rewards of his superior acquirements, the industrious the reward of industry, each earning according to his ability and disposition; he is freed from servile dependence on the judgement and responsibility of his superiors and is made to assume some of the responsibility himself, and has to depend upon his own judgment to a greater extent, which makes him self-reliant. His inventive faculties are called into exercise to devise new and easier as well as quicker means to attain desired ends, and he educates himself and fellows in business methods, and has every opportunity and encouragement to develop any latent faculties he may possess. He learns to set a value on every minute of his time and is not disposed to waste it, because it is a part of his capital; and a very short experience in working by this system enables him to determine the exact money value of any job he may be given. Where it is desired to make trial of the system, the simplest method is for the master painter to base his prices for piece work on the knowledge his experience has given him of the value of each operation under the old plan, represented by so many hours' labor, and deduct

30 per cent. from the cost; the remainder will be a fair price to pay for the operation under the piece-work system. He should first, however, make an alphabetical classification of all cars that come to his shop for repairs, to enable him to again classify the work to be done on them; all cars of one form of construction Class A, of another form Class B, etc., then the needed repairs to these as Class 1 repairs, Class 2 repairs and Class 3 repairs, and more if desired; but the three classes will usually cover all ordinary requirements. This classification of work should be written or printed in form, and posted in the shop for the information of the workmen, and may be in form as follows:

CLASS 1 REPAIRS—OUTSIDE.

Burn off old paint.

(Here describe whatever method is pursued in repainting, from priming to finishing).

Paint roof and black iron-work. Paint, stripe, and varnish trucks.

CLASS 1 REPAIRS—INSIDE.

Fill hard wood and varnish, or whatever other method is pursued, according to inside finish of car.

Repaint head-lining, or replace with a new one.

Repaint sash, varnish blinds and seats, stating number of coats, etc.

Paint floor and platforms.

CLASS 2 REPAIRS—IF HARD WOOD FINISH.

Prime new work and bare spots, and when dry putty up and face down with pumice stone or sandpaper, as may be the practice; then repaint, stripe and varnish on surface thus obtained; paint trucks, roofs, etc.

Clean down and sandpaper, touch up and putty where needed, and give one coat of varnish; rub down and oil off. If inside is painted, give number of coats necessary to this class of repairs.

Clean and touch up head-linings, etc.

CLASS 3 REPAIRS—OUTSIDE.

Scrub down with (here describe what is used). Touch up (under this head a detailed statement may be made, and the amount of such touching up averaged), and varnish (say how many coats), one coat of paint on trucks, and restripe and varnish; paint roof and black irons.

CLASS 3 REPAIRS—INSIDE.

Scrub thoroughly (describe here whatever is the practice or method). Touch up scarred places, and tops of seat-arms and window-sills, and paint floor and platforms. Clean glass, etc.

This classification may be varied according to the requirements of differently constructed cars and the prevailing practice of each shop. Then the working force may be divided into three gangs—No. 1 stripers and varnishers, No. 2 inside varnishers, or hard wood finishers, No. 3 brush hands—one in each gang being appointed gang leader, or foreman, whose business it is to consult with the master painter in reference to all work, to distribute the work among the men to the best advantage, see that they are supplied with materials and tools as soon as wanted, keep the accounts for the gang, and doing his share of the work when not otherwise employed, the master painter assigning to the several gang foremen the cars as they are received into the shop, as their share of work. The account may be kept in the following manner: The master painter keeps a record of cars as they come into the shop, and to whom assigned, with the class of repairs needed or determined upon. The gang foreman also keeps a record of when the car was assigned him, with class of repairs ordered, and from day to day, as an operation is completed on the car or cars, he enters the charge on his book, with date that the operation was completed, thus—

Sept. 1. To coat of priming, No. 123, Class A, passenger-car.....$1.40
Sept. 3. To second coat, No. 123, Class A, passenger-car.. .. .. 1.40
Sept. 4. To puttying, No. 123, Class A, passenger-car..... 4.00
Sept. 6. To third coat, No. 123, Class A, passenger-car..... 1.20

and so on throughout until the car is completed. Each operation, after being finished, is reported as finished to the master painter, who inspects it at his convenience and before the next operation is begun, when, if it is satisfactory, he accepts it, and gives credit in his account-book for the amount due to that gang; if not, it must be made satisfactory before credit is allowed. On the day before the last day of the month, the gang foreman closes the accounts of his gang and hands his book in to the master painter, who compares it with the accounts kept by himself, and if found correct it is so marked and returned, and the master painter returns his to the office of shop clerk. In addition to keeping the accounts the gang foreman also keeps a time book, or record of the time made by each man, and at the end of each month the total sum of earnings is divided by the total number of hours' labor, which will give the amount per hour of earnings which each man is entitled to receive for the number of hours he has worked.

That there are no objectionable features to the system is not to be expected, and therefore we will close this paper with what appear to be the most serious, as we have experienced them. It fosters, if it does not create, intense selfishness and greed in the employé; the weak are crowded out, and the strong overwork and break themselves down in a short time, exemplifying in a manner the Darwinian theory of the survival of the fittest. It is a serious obstacle to apprenticeship, and a hindrance to teaching boys a trade, for, as we have shown, there is no place for the unskillful or the weak in piece work, nor have men working in this way any time to devote to the instruction of learners.

SUCCESSFUL RAILWAY MANAGEMENT.

A WRITER in the *National Car-Builder* devotes two columns to urging the necessity of more mechanical training among the higher officials of railways. He ascribes the inability of many roads to make a profit to this lack of mechanical knowledge on the part of managers; and gives some instances of leaks which might have been stopped or prevented.

It is possibly desirable that every man should possess full knowledge of every subject, and ability to do every thing. But, fortunately or unfortunately, we are not so constituted. Time was when the field of human knowledge and experience was very limited, and it was possible for one mind to compass it all. But "the thoughts of men have widened with the process of the suns." The

horizon of knowledge, which at first seemed so near and receded so slowly, now seems illimitable and infinite. It has come to be acknowledged in these later days that important results can only be obtained by confining one's field to some specialty and working for that alone. A certain degree of versatility is admissible—but one's life work to be effective must lie in some certain channel. "No man can serve two masters." If he would be a good lawyer he could not be a good doctor. A poet is never a good mechanic. Each has his particular adaptation. The one may appreciate, enjoy and use the works of the other. He may even direct the thought and purpose of the other—though he could not think the same thoughts nor do the same work himself. It is a wise provision of providence which gives men different predilections and tendencies. The different departments of life fit into each other. A man may know something on almost every topic, but unless he has some specific work to which he devotes himself and in which he excels he will be a failure. A river may spread out very widely and yet be navigable if it has a channel—but if its whole breadth be shallow, it is useless. The same is true of a man; if he has a deep channel for his natural and acquired abilities he may let his mind run over into adjoining fields of knowledge and yet feel secure.

Now there is no such profession or trade as "railroading." The operation and management of railroads requires a number of distinct and in some respects essentially different classes of men. This fact becomes more and more apparent daily. We do not believe there is a man in existence who "knows all about a railroad" and is fully fitted by natural ability and acquired information to fill creditably any position from brakeman to president. He may be a good "passenger man" or a good "freight man" or a "shrewd purchaser" or an "excellent mechanic"—but he cannot be all. This fact is recognized in all companies which are large enough to require the services of a sufficient number of officials for organizing into departments. Thus we find that the larger railway companies have an executive, a legal, a treasury and accounting, a traffic and operating department. These again are subdivided—the traffic, into freight and passenger; and the operating into transportation, road and mechanical departments. It is true that men are frequently transferred from one department to another, but that is because of the development of the fact that his abilities fit him better for the new position. But the master mechanic does not often become chief engineer or solicitor; nor does the treasurer or auditor become car-builder or bridge supervisor.

Mangerial ability is something distinct from and in a sense superior to all others. It does not require specific personal knowledge of mechanics, or law, or trade; but it requires the ability to select men who do. The surest index to the ability and character of the President of the United States is his cabinet. He may know very little about finance, but may have the discrimination to select and appoint as secretary of the treasury, a man who of all others is best fitted for that position. And he is a far better president who is able to select the most competent cabinet officers and vest them with due authority in their own departments, than he who is conceited enough to belive that all knowledge is concentrated within himself, and selects only tools to do his bidding. It is beyond the power of any railway manager to extend his supervision to all the details of the service. He must entrust them to others. He is the best railway manager who secures the most perfect organization and the best men in charge of all departments of it. He must have many of the attributes of the successful general. He must be a good judge of character—an ability which he may exercise in diplomacy as well as in the selection of subordinates.

The writer named mentions several instances of lack of knowledge on the part of managers and superintendents. He implies that they should be thoroughly posted on such topics as car-painting and iron manufacturing; and should be expert accountants. It is no part of a manager's duty to be posted on paints and oils; but it is his duty to secure a man in charge of the proper department who is so posted. It may be asked how he can do this if he is not himself thoroughly acquainted with the subject. That is just where the managerial talent comes in; it is in the nature of business tact—not an intuition, but the combined product of intuition and observation. Such a manager does not need to spend time on trifling details; he holds his subordinates responsible for them. If he wishes to investigate any subject with a view to reform, he calls upon the proper subordinate official to report to him upon that subject. If the subordinate can not make a reliable report, he will get one who can. He requires every head of department to be "up with the times" and to devote his best endeavors to the company's service. He will not tolerate mere machine men; and so far from discouraging suggestions, will require them.

But we did not undertake to give a recipe for an efficient general manager. The point which we make is that the managerial ability, upon which the success of any well-located road principally depends, is something entirely different from and independent of mechanical knowledge. What is needed is not a higher mechanical training on the part of chief railway officials—but that each man should excel in his special department; and should be held responsible to the general management. The tendency of the day is toward this system, and it is the correct tendency. It does not alter the case to say that there are many incompetent railway managers and superintendents. That is true, but the same thing runs all through the service. No amount of mechanical perfection will of itself make a road prosperous. Money may be saved in one way only to be lost in another. Perfection is to be sought in all departments; and it is the business of the general management to harmonize all and see that all alike are properly cultivated.—*Railway Review.*

Railway Accidents in Great Britain in 1884.

THE following is the record of railway accidents in Great Britian during the year 1884, compiled by the London *Railway News:*

Of railway servants 29 were killed and 341 injured while employed in coupling or uncoupling of trains, 42 were killed and 554 injured in getting on or off engines, 41 killed and 119 injured by being caught between vehicles, 26 killed and 107 injured by falling between the train and platform, 113 killed and 153 injured while working on the permanent way and sidings, 149 killed and 238 injured while

walking, crossing, or standing on the line in the course of their duty. In the table following will be found the number of servants of railway companies killed and injured by train accidents and while engaged in their several occupations in the respective years 1874 to 1884, and the proportion of the whole number killed and of the whole number injured to the total number employed, being calculated upon the numbers given in the returns presented to parliament in the years 1874 and 1884. The numbers employed are known accurately only for the years 1874 and 1884. They have been calculated for the intermediate years on the assumption that the numbers have increased in regular proportion year by year:

	By train accidents.		Other accidents on railways.		Proportion of accidents to number employed.	
Year	Killed.	Injured.	Killed.	Injured,	Killed.	Injured.
1874.....	46	271	742	2,554	1 in 327	1 in 89
1875.....	21	239	744	3,379	1 in 334	1 in 70
1876.....	28	236	645	2,364	1 in 385	1 in 96
1877.....	22	154	620	2,009	1 in 414	1 in 123
1878.....	15	156	529	1,847	1 in 500	1 in 135
1879.....	8	118	444	1,836	1 in 619	1 in 143
1880.....	23	118	523	1,962	1 in 531	1 in 139
1881.....	19	168	502	2,278	1 in 576	1 in 123
1882.....	21	153	532	2,423	1 in 570	1 in 122
1883.....	11	87	543	2,373	1 in 596	1 in 134
1884.....	23	115	523	2,204	1 in 634	1 in 149

The table shows that there has been an almost steady decrease during this period in the proportion of servants killed and injured to the number employed. The following table shows the number of men employed by the companies in various occupations and the number of fatal accidents and injuries to each class in 1884, and thus affords an idea of the relative amount of risk run by the various classes of railway servants:

				Proportion to number employed.	
Class of servants.	Number employed.	Kld.	Inj.	Killed.	Injured.
Brakers, and good-gds....	7,047	53	447	1 in 139	1 in 17
Gatekeepers.....	1,605	10	8	1 in 160	1 in 200
Permanent-way men.....	37,840	125	154	1 in 303	1 in 245
Firemen.....	12,795	31	152	1 in 422	1 in 84
Engine-drivers	12,874	27	138	1 in 476	1 in 92
Porters and shunters.....	48,070	97	732	1 in 494	1 in 65
Inspector.....	3,518	7	34	1 in 502	1 in 103
Guards, passenger.....	5,902	6	68	1 in 983	1 in 87
Ticket collectors, etc.....	2,060	2	8	1 in 1,030	1 in 257
Points and signalmen.....	19,012	18	49	1 in 1,056	1 in 390
Laborers.....	70,405	41	84	1 in 1,717	1 in 840
Station-masters.....	6,165	3	6	1 in 2,055	1 in 1,027
Mechanics.....	55,940	20	39	1 in 2,797	1 in 1,434
Other classes.....	62,833	106	400	1 in 592	1 in 157
*Total.....	346,426	546	2,319	1 in 634	1 in 149

*Employed in the traffic, locomotive, etc., and engineers' and storekeepers' departments.

The number of causes which contributed to the investigated accidents of the past year have, in some instances, slightly decreased in comparison with those of the previous year, although the number of accidents inquired into has increased by nearly 12 per cent. There is an increase over the previous year in the number of accidents due to defective maintainance and construction of roads, but a considerable decrease in accidents due to defective construction of rolling-stock, to insufficient or defective accommodation, to defective signal arrangements, from the want of block working, the mistakes of officers and servants, and to excessive speed. There is no improvement, however, under the head of accidents due to inadequate or unsuitable brake power.

The principal causes which led to the accidents appear to have been: (1) Negligence, want of care, mistakes; (2) inadequate or unsuitable brake power; (3) excessive speed; (4) defective maintenance and construction of roads or works; (5) defective system of securing intervals between trains.

The Steel-Rail Trade.

THE few last weeks have, according to the *Iron Age*, taught a lesson to many iron manufacturers who were induced by the boom talk earlier in the season to hold out for higher prices. Many of them are now endeavoring to fill order-books because the bids they declined went to more conservative competitors, and the result is that prices are practically where they were. The entire trade applauded the steel-rail makers when they put aside trade rivalries and personal animosities, and, early in August, adopted the policy which has borne such excellent fruit. Rails were then selling in large lots at $26 at eastern mills, and there is reason to believe that even that figure was shaded in more than one instance. Now they have been getting generally $30 at mill for next year's delivery. That is certainly a substantial advance, although it must not be forgotten that part-time work, under the allotment plan, means a slight increase in the cost of manufacture. There has been for some time a feeling among some of the mills that the situation warrants a further notable advance, and claims have been repeatedly put forward that $1 or even $2 more at mill have been secured for round lots, 1886 delivery. The accuracy of these statements is questioned on the ground that lower bids have repeatedly caused the loss of orders within the last week. The situation as it is to-day may be summed up as follows: An estimate of the orders for 1886 delivery which it is known have been placed, and their distribution among the different actively competing mills, give color to the assertion that between 375,000 and 400,000 tons have been ordered thus far by the railways. That would be equivalent to about one-half of the allotment, though it should be noted that, so far as is known, four mills having an allotment together of roughly 140,00 tons, have as yet an empty order-book. They could, according to agreement, if they chose, transfer any part or the whole allotment to any other mill for any consideration the parties to the transfer might see fit to settle upon. We mention this point as showing that thus far the leading mills have taken more than one-half of their allotment, and that circumstances might lead to their adding to their work beyond it.

The question which now comes up as the outgrowth of the fact that one-half of the allotment is already placed, is whether it would be wiser for the rail mills to increase the allotment, which is unquestionably below the actual requirements of the country, or whether it would be more judicious to create higher values by allowing the real or assumed indifference of sellers to operate. It may be stated at the outset, to relieve the rail mills of the odium attending too rigorous combinations, that they are still competing very rigorously, in spite of the fact that a good deal of unnecessary bidding is avoided very often by previous understanding among sellers. Leading representatives of the steel trade express the conviction that the demand for 1886 work will ultimately certainly foot up to 1,000,000 gross tons, and that at least 200,000 tons in addition will be alloted to the different works. They hold it to be a very unwise policy to attempt to drive up the price, because it is likely to cause a reaction among buyers who are already beginning to show a spirit of antagonism. A good deal of work is still being withheld by the railways, who are quietly awaiting developments. "Booming" the market will not frighten them. It will, on the contrary,

offer additional inducements to them to take the risk of waiting. The rail mills have shown an excellent spirit during the history of the combination thus far. Some of the works have voluntarily given to others who held that they had not been fairly treated in the allotment a part of their tonnage, but any abuse of their power would be dangerous. Economy is so closely watched nowadays among railway boards of directors that, while orders for rails at $30 would be promptly sanctioned, they might be vetoed if sellers demanded $35.

Discussions at the Master Mechanics' Convention.

THE following are the subjects to be discussed at the next meeting of the American Railway Master Mechanics' Association, to be held in Boston, in June, 1886, and the committees to report thereon:

Improvement in Boiler Construction: Geo. W. Stevens, Wm. Fuller, T. J. Hatswell.

Standard Driving-Wheel Centers and Standard Section of Tire: J. N. Lauder, Jacob Johann, H. N. Sprague.

Driving-Wheel Brakes: To what extent is their use advisable, and Best Method of Application: J. Davis Barnett, H. A. Whitney, F. M. Wilder.

Balance Slide-Valves: Charles Blackwell, James Meehan, E. M. Roberts.

Best Material and Form of Construction for Locomotive Guides and Cross-Heads: A. J. Cromwell, William Swanston, A. Beckert.

Best Plan for Removing, Cleaning and Resetting Flues: Clem. Hackney, A. W. Sullivan, G. H. Prescott.

Shop Tools and Machinery: D. A. Wightman, A. J. Pitkin, F. B. Miles.

Hammer-Blow Tests of Locomotives: William Woodcock, Thos. L. Chapman, Coleman Sellers, Angus Sinclair, F. W. Dean.

Papers to be read by two Associate Members, viz.: Robert Grimshaw and John A. Coleman.

Railway Taxation in New Jersey.

THE state board of assessors of New Jersey have filed with the comptroller their second annual return under the new Railroad Tax law. Ninety-six railways and canals are assessed, almost all of which are included in four systems—the Pennsylvania, the Philadelphia and Reading, the Delaware, Lackawanna and Western, and the New York, Lake Erie and Western. The total valuations of all the roads are as follows:

For road-bed, etc., of main stem, $81,108,600; for real estate, excepting road-bed, $37,970,412; for personal property, equipments, etc., $21,702,080; for franchise, $52,183,293, Total, $192,964,385.

Last year the total was $190,437,993. This years valuation and tax is divided as follows:

Pennsylvania system—Valuation, $61,904,991; state tax, $309,525; local tax for cities and towns, $97,332; total tax, $406,857.

Reading system—Valuation, $46,738,642; state tax, $233,693; local tax, $84,386; total tax, $318,079.

Erie system—Valuation, $12,324,589; state tax, $61,622; local tax, $43,185; total tax, $104,807.

Lackawanna system—Valuation, $37,209,902; state tax, $186,049; local tax, $68,950; total tax, $254,999.

Independent roads—Valuation, $34,786,261; state tax, $173,931; local tax, $83,632; total tax, $257,563.

Compared with last year, the returns show in the Pennsylvania system increases of $4,455,766 in valuation, $22,279 in state tax and $5,978 in local tax. In the Reading system there are decreases of $5,034,007 in valuation, $25,169 in state tax and $103 increase in local tax. In the Erie system there are decreases of $692,043 in valuation, $3,460 in state tax and $1,221 in local tax. In the Lackawanna system there are increases of $2,483,346 in valuation, $12,416 in state tax and $2,024 in local tax. In the independent roads there are increases of $1,313,329 in valuation, $6,566 in state tax and $49,118 in local tax. The total net increases in state tax are $12,632, and in local tax, $56,004.

Of the independent roads, the principal ones are the Lehigh Valley and its Easton and Amboy road, which will pay $45,625 state tax and $10,402 local tax on a valuation of $9,125,133, and the New York, West Shore and Buffalo, which will pay on a valuation of $7,906,754 a state tax of $39,533 and a local tax of $46,533. Thirty-four of the ninety-six railways in the state are still contesting the taxes assessed last year under this law.

French Railway Benefit Associations.

IN France the six great railway companies which control the main lines have plans for assuring help to their employés in its service; and when they are too old to work, all combine charity with self-help, in one case by a compulsory retention of a percentage of wages, in another by an assessment, which the men are free to pay or not; but always based on a proportion from the corporation, calculated either on its earnings or its business. Over one hundred and twenty-eight thousand men belong to these mutual aid societies, from the chief engineers down to the humblest employé on the road. Only one of the companies publishes a detailed statement of the amounts paid out by it from the funds of its society. Of a hundred and fifty pensions in 1883 one hundred and thirty-six went to workmen—four receiving a hundred dollars apiece annually, eight a hundred and twenty-five, four a hundred and fifty, and the others two hundred dollars or more. Besides these sums, paid after the expiration of a whole lifetime spent in the service of the company, there were large numbers receiving smaller amounts in compensation for accidents, and there were considerable sums spent on widows and orphans, medical attendance and other such kindly offices. Two of the companies guarantee a minimum pension of a hundred dollars for bachelors, and a hundred and twenty dollars for married men.

Nearly all the great corporations in France have a similar system in force for their men—water works, gas works, insurance companies, banks, both public and private, all make provision for the health and comfort of the employés and for their old age. In England, in Belgium, in Germany, and in all the great centers of industry and capital abroad, there is this wise combination of charity on the part of the owners with preparation for the future on the part of the employed. Neither benevolence on the one hand nor economy on the other can do as much for the workman as a judicious admixture of contributions form

the capitalist who profits by the experience of those who give their lives to his interests, and from the wages of the man who, by beginning while he is still young to save systematically, is encouraged in his labor and in a life of prudence and sobriety by knowing that the return and the reward are sure to come.

The South American Transcontinental Line.

THE first section of the South American transcontinental road extends from Rosario, on the river Parana, westward to Ville Maria, and is 120 miles long. Another section of 82 miles was built by the Argentine government in 1873, and in 1875 the line was extended 76 miles to Ville Mercedes. In 1880 the government completed 59 miles more, taking the road to the city of San Luis. Two years later rails were laid to La Par, 76 miles, and in April last, the completion of the line to Mendoza, 80 miles further, was celebrated by a grand festival. From that point a branch 100 miles long has been constructed northward to the city of San Juan. On the other side of the Andes the Chilians are using a railway 100 miles long, extending from Valparaiso to Los Andes. The gap between the Pacific and Atlantic sections of this trans-Andean road is only 140 miles in length. The route has been surveyed through the Uspallata pass, and it is believed that the missing link will be supplied within two years.

An Early Locomotive.

MR. W. A. CRAFTS, clerk of the Massachusetts Railroad Commission, says in the *Congregationalist*: "The writer remembers seeing, when a boy, a trial trip on the Boston and Worcester Railroad of its first locomotive, built by Robert Stephenson in Newcastle, Eng. It was Fast-Day morning, and, seen from a distance as it went over the back bay, leaving a long trail of smoke and steam behind, it seemed to our inexperienced eyes almost to fly. Fast-Day fifty years ago was not the secular holiday which it has since become, and the limited population of Boston furnished a small number of idlers and pleasure seekers, compared with those of the present day. But in the afternoon large numbers of people, including staid attendants at the morning church service, went to take a look at the new wonder, and were astonished to see it haul, with apparent ease and remarkable speed, ten or twelve loaded dump-cars. This locomotive was mounted on four wheels and weighed about eight tons. By the side of the powerful engines of the present day, weighing forty, fifty, or sixty tons, it would appear as a mere toy. But locomotive construction was then in its infancy, and even six years later the directors of the Boston and Worcester road had grave doubts as to the expediency of adopting engines weighing eleven or twelve tons."

The Master Car-Builders' Car-Coupling Tests.

THE Master Car-Builders' Association have issued the following circular in relation to the recent car-coupling tests at Buffalo:

The executive committee of the Master Car-Builders' Association held a public trial of automotic car-couplers at Buffalo last September, and they selected twelve of the number submitted to be put in service, to the extent of ten cars each, during the coming winter. A sub-committee was then appointed to arrange the details of these trials in service, and this committee is now perfecting arrangements to have ten line-cars, which pass over trunk lines, equipped with each of the twelve couplers selected, and they hope to have them all in service by December 1st.

Each car equipped with these trial couplers will have the following stenciled plainly on each side of the car near one end:

"M. C. B. test .....coupler"

(the name of the coupler on each car being used in the space here left blank), and when the couplers are all in service an additional list will be issued, giving specifically the numbering and lettering on each car equipped with each coupler. In the meantime the stenceling placed upon the cars will serve to identify them. It is desired that these couplers be kept up and remain in active service until May 1st, 1886, and a full and detailed report of the cost of all repairs, as well as of the working, or the failure to work safely, of these couplers will be looked for from all members of the association who are connected with any railroads over which any of these couplers may pass up to that date.

Members of the association are earnestly requested to see that all car-inspectors and foremen of repair shops, as well as trainmen, on the lines with which they are connected, have proper instructions in this matter, and that reports should be made at such a date as will enable members to forward their reports to the secretary in New York not later that May 10th, 1886.

By placing the couplers for trial on line-cars, it is thought that reports may be had from the same source on a number of different couplers, and in order to make the style of such report more uniform and easy for tabulation, we give the points which it is especially desired to have information upon while the cars are on your line.

1. The nature and cost of repairs to couplers on each car receiving such repairs, by car number and name of coupler.

2. State whether there has been any failure of any coupler to couple automatically with its own kind, specifying what couplers have so failed and in how many instances and the cause.

3. State whether any of the couplers have automatically uncoupled when in service on your line, specifying what couplers have so behaved, with the number of such occurrences for each coupler, and with cause and circumstances.

4. Give opinion of your trainmen as to the comparative safety in coupling and uncoupling each style of couplers which have passed over your line when coupled with one of its own kind.

5. Give opinion of your trainmen as to the comparative safety or danger involved in coupling each of the couplers which have passed over your line with the ordinary draw-head, as compared to coupling two ordinary draw-heads together.

6. Give any further information of importance on points not included in the foregoing, which may have been noticed with regard to any of the couplers which have passed over your line.

By order of the executive committee,

M. N. FORNEY, Secretary.

November 20th, 1885.

The Keeley Motor Humbug.

A PHILADELPHIA capitalist states, according to a Washington letter, that if the true life of Keeley, the motor man, could be written it would prove to be one of the most romantic stories of imposture ever known. He says that several years ago, when Keeley's great claims began to be talked about in Philadelphia, he made an investigation for his own sattsfaction into Keeley's past. He thought that he could judge better by his record as a man than by trying to talk with Keeley about his mysterious motor. He found that, just before coming to Philadelphia, he was a performer in a circus, and that he had, nearly all of his life, made a precarious living by performing sleight-of-hand tricks. He is a man of no education, and is absolutely destitute of any scientific acquirement. He says that Keeley has gone to work, however, very skillfully, and has learned the jargon of an extensive scientific vocabulary. He has about eight hundred of these words and phrases at his tongue's end, and he can turn the head of the average scientist by the rapidity and certainty with which he tosses these words and phrases into his general conversation. Keeley has one gift, he says, which is great enough to be called genius, and that is his skill in humbugging people. He has great power,

by mere talk, of setting aside all doubt as to his ability and to influence people to let him have money in the most recklessly confident way. Nearly all of his present backers are New York men. Every now and then these backers become despondent and get together and go over to Philadelphia. Then Mr. Keeley gets up a sleight-of-hand performance for them, talks to them in his peculiarly gifted way, and the trusting capitalists go back buoyed up with hope, fully confident that they are backing one of the great inventors of the age. Keeley has never invented anything, this gentleman says, except stories, and will never give any other dividend upon the capital invested in him beyond that of romance and diversions in the shape of occasional sleight-of-hand performances.

How to Tell the Speed of a Train.

A RULE was recently contributed to *Engineering* by a professor in the Polytechnic School at Prague, for readily determining the speed of a train by counting the revolutions of the drivers, which has a certain convenience, and is as follows:

Count the revolutions for a number of seconds equal to 2-11 of the diameter of the drivers in inches. The number of revolutions counted will be the speed in miles per hour.

For example, if the drivers be 55 inches in diameter, 2-11 of 55 is 10; and if 24 (or any other) number of revolutions are counted in that number of seconds, the speed is that number of miles per hour.

The Coventry Engine.

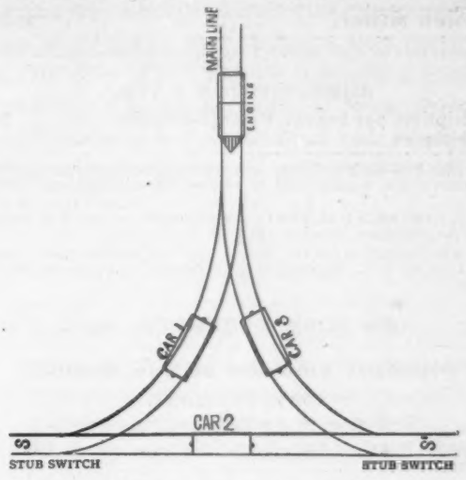
A NEW locomotive is undergoing trial on the Pennsylvania Railroad. It is known as the Coventry engine, named after the inventor, a Chicago man. Outwardly, except that the smoke-stack is close to the cab, there is nothing to distinguish it from a common locomotive. The novelty is in the boiler, which has a return flue, thus doubling the length of the tube, and considerably more than doubling the time of the retention of the heated gases within the boiler.

As the heat in the return flue has been frequently tested at between 1,100 and 1,200 degrees, the inventor claims that it is better to utilize it than to let it escape like a rifle-shot from a straight tube. He claims also that the length of the tube insures the consumption of much gas and smoke that must otherwise escape, and that cinders are precipitated by gravity, so that not only is provision made by the invention for the maximum of steam but for the minimum of dirt. It is a bituminous coal engine.

Mr. Coventry says that the engine can be run at a saving of at least 15 per cent. under other engines of its kind, and is cleaner than any other bituminous coal engine can possibly be. He hopes to have the boiler adopted in new engines that the road may build, both for freight and passenger-service. Bituminous coal is used on the Pennsylvania main line. The railway officials say that there is no likelihood of a change in this respect, although they admit that the engine is cleaner than others that use bituminous coal. The claim of economy will be fully tested.

A Problem in Drilling Cars on a "Y" Switch.

THE following problem in drilling cars on a "Y" switch was recently presented in actual practice on the Erie road. The problem was solved at the time, but solutions from the readers of the JOURNAL are solicited.



Each stub-switch, S and S', will hold but one car or engine; each arm or end of the "Y" will hold the full train.

Problem: To turn the engine on the "Y" and restore each of the three cars to its original position.

PRESIDENT GARRETT, of the Baltimore and Ohio, has resigned from the directory of the New Jersey Central, on the ground that having completed his arrangements for the terminal on Staten Island, it would be inconsistent for him to maintain his official connection with the latter road. Mr. Garrett was entertained at an elaborate banquet on Staten Island, given in his honor by Mr. Erastus Wiman, on the 16th of this month.

A WELL of good lubricating oil, it is reported, has been struck near the Oregon Short Line, at a depth of 120 feet. A two-inch hole was first drilled, and it is being enlarged to six inches, and many other wells are being drilled in the districts. There is said to be a rich oil belt there, which, at no distant date, is destined to become an important industry.

THE exports of steel rails from Belgium in the first seven months of this year were 27,315 tons, as compared with 31,476 tons in the corresponding period of 1884. Iron rails were exported from Belgium in the first seven months of this year to the extent of 4,552 tons, as compared with 12,552 tons in the corresponding period of 1883.

THE Passaic (N. J.) and New York Railroad, as the new spur of the New York, Susquehanna and Western Railroad is called, will begin running passenger-trains about January 1st. The trains of the branch connect with the main line a short distance above Hackensack.

THE balloting for a standard brake-shoe and head conducted by the Master Car-Builders' Association, has not yet resulted in a choice for adoption.

CONTINUOUS brakes of one kind or another have been placed upon 32,052 passenger-train vehicles in Great Britain, and there are 18,460 vehicles without such brakes.

American Railroad Journal.

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NEW YORK, DECEMBER, 1885.

Principal Contents of this Number.

BOTH SIDES OF THE STATEN ISLAND BRIDGE QUESTION.

IF the recent traffic agreement between the Baltimore and Ohio and the Staten Island Rapid Transit Company is a genuine one—and its genuineness is doubted in some quarters—in its attempted fullfilment there will be a vigorous struggle not confined to rival railways, but national in its importance. It may be reasonably expected that the Pennsylvania road will bitterly oppose the projected line of the Baltimore and Ohio, in which it will be seconded by the Lehigh Valley and other interests; while the New York roads will, in general, support the efforts of the Baltimore and Ohio. Were the struggle confined to these great railway corporations there would be little in it different from the usual warfare accompanying ordinary railway projects of any magnitude. But the necessity for bridging Staten Island sound in order that the Baltimore and Ohio may make its terminal connection brings the two states of New York and New Jersey into direct conflict, and this conflict will be fought in the halls of congress.

On the part of New York it is claimed that there is no justice in New Jersey's opposition to the bridge. Staten Island, with its magnificent stretch of water front, has been shut off from the main land simply through the unwillingness of New Jersey to prosper the interests of the empire state. The water front on the Jersey shore facing New York City is controlled by a few railway corporations who practically monopolize the traffic and can have things pretty much their own way. A chance now occurs to develop the north shore of Staten Island and to put a check upon the aggrandizement of the Pennsylvania road. New Jersey selfishly interposes her objections, and congress is appealed to in the interests of common sense and justice to sanction the scheme and overrule New Jersey's opposition. So much for New York's side of the question, and it must be confessed there is a good deal of reason in the argument.

On the other hand, in the construction of the bridge New Jersey has to face a serious blow to state pride and importance. To the good inhabitants of our sister state Staten Island has been a bitter subject of reflection for two or three generations. By every law of geography the island was Jersey soil. The broad Hudson flows between it and New York, and there is no apparent reason why the state line should veer at the kills and cut off the verdure-clad hills of Richmond county from its rightful owners. The original commissioners, by an ingenious and not overly honest construction of fact, contended that the channel of the Hudson river was the state line, and that this channel ran to the westward of the island. Having so chosen and having thus cut off the immediate harborage of New Jersey and relegated it to the creek-like shores of Arthur

kull, or Staten Island sound, and New Jersey having accepted this manifestly unjust division of territory and, laboring under these disadvantages, constructed terminals of its own on these uninviting shores, it seems hard for her to be robbed of these few advantages. It has stung the inhabitants of the state to hear it alluded to as a "towpath between New York and Philadelphia," and fortunately there were instances of independent terminals which assuaged the wounded pride of Jerseymen. The construction of the bridge would render the state more "towpathian" than ever, and several of her railway industries would be crippled beyond hope. "Give us Staten Island," say the Jerseymen, "and you may build the bridge." And certainly there is method and reason in their argument.

But beyond mere questions of state pride there are other operating reasons, pro and con, relative to the proposed connection. It is undoubtedly true that the terminal facilities on the Jersey shore are cramped and meager, and are held by but few corporations who work them for what they are worth and indulge in the process of freezing out formidable rivals. The Baltimore and Ohio, a powerful railway, has been denied access to the shore facing New York save on most humilating terms. The shores of Staten Island afford an admirable opportunity for extending these facilities and striking a blow at the monoplies which control the shorage.

On the other hand, the construction of the proposed bridge would work incalculable injury to the navigation of Staten Island sound, and it is a fact that, small and insignificant as may seem this narrow stretch of water, more vessels pass through it every year than pass through the Narrows. It is the first of the chain of inland waterways between New York and the south, and the bridge would be a serious impediment to its navigation.

Of one thing we are convinced, and that is that the Baltimore and Ohio had better secure another string to its bow. The construction of the bridge will be bitterly opposed by the Pennsylvania and allied roads, and by the vast bulk of the people of New Jersey. It is doubtful if the congress has the power to do more than permit the construction of the bridge; it is claimed that its part in the business is merely passive and the opposition of the state of New Jersey can render this permission valueless. But even if the law is differently construed and the bridge is finally built, it is difficult to see how the Baltimore and Ohio is going to obtain permission to construct its eighteen miles of road between Bound Brook and Elizabethport and so connect with the bridge. It has been stated that the Pennsylvania road has unduly influenced legislation in New Jersey, but if we are not mistaken it will on this occasion, without occult means of argument, find in the state a ready ally.

Mr. ERASTUS WIMAN, the enterprising railway magnate of Staten Island, has publicly announced that he asks nothing from New Jersey, and that the bridge will be built and his projects carried through without Jersey's consent; but we would advise Mr. WIMAN to go slow. He is, as we understand, a Canadian and cannot be expected to comprehend the cherished theory of states' rights; but we would advise him to adopt a more conciliatory tone. He will find New Jersey a state with a good deal of spunk, and if he has any hopes of accomplishing his project it would be well not to tread upon New Jersey's bristling tail. He may yet be an humble suppliant for favor at her hands.

1885.

THERE is every reason to believe that in bidding farewell to the closing year we are bidding farewell to the darkest period of commercial and financial depression. The outlook for a revival of trade is encouraging, the dullness and apathy characterizing every feature of industry has been shaken off, and cautiously and tentatively, but nevertheless with considerable confidence, every branch of trade is preparing for the dawn of a brighter period.

The year 1885 has been a dull one as was predicted, but it required little power of foresight to make the prediction. The country had for once realized that progress could be overdone. To use a homely metaphor, the griddle cooked faster than the people ate, and in the past year we have suffered from the overzealous haste of our capitalists to keep abreast with the times. They have done more—they have outreached the times.

It is needless to allude to the patent fact that the outgoing year has been the dullest railways have known for a decade. Railway construction seems to have reached its lowest ebb and railway bankruptcy its highest. Ruinous competition has forced many a road to the wall, and there are now a number of roads in operation which could be put to the best possible use by tearing up their tracks and selling them for old iron. But the year has, nevertheless, been a wholesome one and has taught the railway world some severe and needed lessons. For one thing it has directed public attention to the evils of paralleling, and inaugurated a movement to kill such schemes in the future. It has taught railways the advantages of conservatism, and there will be fewer hot-footed railway projects floated in the future. It has taught the legislatures the necessity for deliberation in the bestowal of charters, and it has taught the courts the imperative need of improvement in the methods of handling insolvent railway corporations. All these are useful lessons and there is every reason to believe they will not be forgotten—at least during the present generation.

Not alone in the world of business has the year been

one of sad retrospect, but in the every branch and calling of life. The necrology of 1885 includes great and powerful names in church and state, in trade and finance. Successively died at short intervals, GRANT, MCCLELLAN, and HENDRICKS, names prominent in the country's history. The powerful head of the Romish Church in America, Cardinal MCCLOSKEY, is also numbered among the honored dead, and the last month of the year has seen the death of VANDERBILT, the richest man the world contained; the man whose power and influence was felt in every railway in the land.

It has been a dreary and sorrowful year, and we turn from it to greet, with renewed trust, the dawn of 1886. After the shadow comes the sunshine, and the gloomy experience of the past prepares us with keen appetites for the era of prosperity that cannot be long delayed, and which we fondly trust and believe is to be ushered in with the New Year.

EDITORIAL NOTES.

THE enormous wealth of WILLIAM H. VANDERBILT, while not the only instance of great fortunes made in railway investment, is the most conspicuous. The old Commodore had read the signs of the times with unerring accuracy, and having left his son nearly one hundred million of dollars, the mere cumulative power of money alone would have of itself doubled the fortune in a dozen years. His son's discretion shortened the period of increase, and it is to the latter's credit that the fortune was doubled honestly. The time is past for the accumulation of such immense wealth through railway speculation, and it will be many years before the world again sees as rich a man as VANDERBILT. That the times have changed, and for the better, is evident from the fact that the death of this man—the most powerful railway magnate in the world—caused little stir in railway circles, and his immense property is quietly divided without a flurry in the stock-market.

* * *

AND coincident with the death of VANDERBILT comes the report that JAY GOULD is to retire permanently from Wall street. The fact that JAY has announced his intention to retire is not, to some doubting minds, sufficient cause for belief, but it were a consummation devoutly to be wished. The true interests of railways would be better served if this rather secretive gentleman should conclude to enjoy the profits of his numerous speculations in seemly retirement. And there are several other gentlemen of his same ethical make-up, whose retirement from the purlieus of Wall street would not increase the deviousnous of that financial alley. The railway world has had enough of speculation for some time to come.

A CORRESPONDENT of a German railway paper advocates the division of railway fares into six classes. In England they have three classes but that is not sufficient for our German friend and he desires a still further classification of the passengers, But why stop at six classes? There is no limit to the number of classes that the truly brilliant mind may create. There may be the drunken class and the sober class, the smoking class, and the non-smoking class, the male class and the female class, the rich class and the poor class, the married class and the single class—in fact, the vision of classes is illimitable.

* * *

A MOST gratifying signal of revival is the railway enterprise that is awakening in the south. That long divided section of the country, laboring under the disadvantages of an unsuccessful war and consequent poverty and general misery, is capable of wonderful development, and it is now waking up for the first time in twenty years. When railway construction is again pushed with healthy vigor the old south, or rather the "New South," as it is not inaptly called, will offer a fruitful field to the railway investor. But there is plenty of time for careful deliberation. The matter of southern railway construction can easily be overdone.

* * *

COMMENCING with the January issue, the *Railway Purchasing Agent* disappears, and our bright and enterprising Chicago contemporary will hereafter be known as the *Railway Master Mechanic*. The new title of this publication is much better than the old, and at once gives it a pronounced and useful field of operation. It has been rather surprising to us that among the multitude of railway publications none have yet secured so valuable a title, and we wish our contemporary all the success it deserves, which is wishing it a great deal.

* * *

THE American Committee of the Statue of Liberty have made an appeal to the public for $40,000 to erect the statue. While the success of their endeavors to raise the necessary amount is devoutly to be wished, and while it is the duty of every American to aid them all he can, there is nevertheless a feeling prevalent that the committee have not been altogether open in their statements to the public. Less than a year ago it was stated that $100,000 were necessary to complete the pedestal, and the *New York World* proceeded to collect the amount with commendable enterprise and energy, and succeeded. Now comes the announcement that another large sum is needed to erect the statue; and, for all we know, when the statue is erected there will be a call for a further amount to do something else. The committee could have easily stated in the beginning that they wanted

$140,000, and probably the *World* would have raised the whole amount with as little trouble as it raised the pedestal fund. It is certainly very discouraging to the American public, who thought that when they were contributing to the pedestal fund they were meeting with the last expense, to be told that other work must be done; and it seems as if in the end congress will have to make an appropriation, which is after all, perhaps, the best way out of the difficulty.

* * *

As we remarked last month railway accidents are bound to occur, despite the utmost care on the part of railway officials to prevent them. Derailments are of frequent occurrenee, and a serious one recently took place on the Canadian Pacific Railway, accompanied with severe injury to the rolling-stock and discomfort to the passengers, though fortunately no lives were lost in the catastrophe. Of course attention to road-bed and track will avert many such disasters, but would it not be equally well for railways to forestall their occurrence by providing safety appliances on their rolling-stock, so that if derailments do occur the resultant injury to cars and passengers can be lessened, if not entirely averted? In the construction of safety-truck appliances the railway inventor has a fruitful field.

* * *

THE *Railway Age* is carrying the war into Africa and is urging the adoption of "Rd." and "Ry." as the abbreviations of "railroad" and "railway," respectively. In this effort we join hands with our esteemed contemporary. We go further and say that a decision should at once be reached as to whether railroad or railway should be the generic name. Every argument seems to point to the superiority of railway, and we have uniformly adopted it in our columns, though with seeming inconsistency our publication is denominated the RAILROAD JOURNAL. For this another generation is responsible and were not our bump of veneration so prominent we would even at this late day substitute the euphonious "railway" for the cumbersome "railroad" which for sixty-five long years has stood at the head of our columns.

* * *

SHEEP-KILLING is stated to be a popular sport on western railways and the Virginia City, (Nev.) *Chronicle* reports the achievement of an engineer on a train near Reno, who killed forty sheep out of "a possible seven hundred." Well, if an engineer must kill something let us rejoice that he is content with sheep and doesn't gratify his sanguinary instincts by the slaughter of passengers.

* * *

AN English railway company has passsed a regulation requiring all its employés to wear a red neck-cloth, thus insuring them the possession of a danger-signal always at hand. The company in a burst of generosity has also furnish these neck-cloths "free gratis for nothing." It is an admirable idea and we would supplement it with the suggestion that the company also furnish its employés with white pocket-handkerchiefs to be used as safety-signals.

Outing completes the year with an admirable number, and the career of continued prosperity which seems to have waited upon this publication of a modest beginning is truly wonderful. While in its reading matter it is lighter than the leading monthlies, it is edited with discretion and skill, and artistically ranks among the best of them. The frontispiece, "December," is a work of art, and its accompanying poem fully merits the prominence given it. In furnishing light yet good literature *Outing* is fulfilling an excellent mission.

AMONG its illustrated series of "Artists' Homes," the January issue of Cassell & Co.'s *Magazine of Art* contains an article on the cottage of the well-known artist, Mr. Harry Fenn, at Montclair, N. J. Among others, illustrated articles on "A Polish Village," "Art in Assyria," "The Upper Medway, and "Beds and Bed-Rooms," contribute to render the number an excellent one. A spirited colored frontispiece, "Cranes," taken from a painting in the British Museum, accompanies the issue.

THE December *Century* contains a very valuable contribution to naval literature in a paper by the veteran Ericcson on "The Monitors: their Construction and Work," fully illustrated with fine wood engravings. The paper is supplemented by an interesting account of "The Loss of the Monitor," by Francis B. Butts, one of the survivors. Among the remaining articles of interest is a beautifully illustrated description of "The City of Teheran," written by S. G. W. Benjamin.

THE Christmas number of *Building*, an architectural monthly published by William T. Comstock, at 6 Astor place, New York, is an issue to be commended in every respect. The accompanying designs show taste in conception and execution, and the letter-press is of more than usual interest.

Sechrist's Hand-Book and Railway Equipment and Mileage Guide continues to furnish monthly a valuable amount of railway statistical information that cannot be obtained elsewhere. It is published in Cleveland, Ohio, and not in Chicago as erroneously stated in the October JORUNAL.

THE Almanac for 1886, published by the *Philadelphia Record* for its subscribers, is far in advance of ordinary publications of the kind. It is handsomely illustrated and contains a large amount of statistics and other valuable information.

The Mining and Scientific Press, an illustrated journal of mining, popular science and general news, is published in San Francisco, and appears to be meeting with deserved success.

The Insurance Critic, published in this city, is an able monthly journal devoted to the interests of legitimate life and fire insurance.

The American Inventor, devoted to industrial interests, art. science and manufactures, is an interesting monthly journal published in Cincinnati.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

STREET-RAILWAY CONSTRUCTION IN NEW YORK CITY.

THE marvellous success attending the operation of the Broadway surface road has caused the birth of many street-railway schemes in New York City. Half-digested plans are rushed into print and charters sought for roads to be built on vacant streets that in many cases offer little chance for profitable operation. But the fever has taken hold and New York will have its fill of street-railway schemes even if the numerous projects come to naught.

That street-railway construction is needed in New York no one can deny. As yet, below Walker street, there is no means of cross-town travel in the city, and while two charters have been granted for the construction of cross-town roads in the lower portion of the city it is not to be expected that the promoters of these enterprises will be allowed to construct their roads without strenuous opposition in the courts by others who are nursing similar schemes. The Chambers and Grand street Ferry Railroad Company had no sooner begun the laying of their tracks than they were enjoined by the courts at the instance of a rival organization and the promoters of any new road must look for similar obstructions.

The Fifth avenue railway scheme seems to have met with a decided check and the adverse report from the aldermanic railroad committee has rather dampened the ardor of the street-railway speculators. We have no wish to ascribe to the honorable the board of aldermen motives which they do not possess, and we do not labor under the apprehension that they have the welfare of the city at heart. Their adverse report was simply due to the fact that a certain senatorial committee, yclept the GIBBS committee, have been prying in rather an impertinent manner into the peculiar methods of the city departments, and with the probable investigation of the granting of the Broadway franchise in view our city fathers have thought it well to assume a virtue of they had it not.

In the upper part of the city the air is rife with rumors of new street-railways, and the idea is fast gaining ground that street-railway construction and operation is a sure road to profit. Of the numerous routes suggested but a small number afford outlooks for profit, and it is nearly time a halt was called in the matter of street-railway construction in New York. For many years the city has done without roads that were a necessity, but there is no reason why all at once there should be a deluge of new projects and a series of expensive legal combats between capitalists to obtain charters for roads that could scarcely be expected to prove profitable. True, the expense of this litigation does not fall upon the people, but a reaction is certain to follow the feverish street-railway agitation and the true interests of street-railways as well as those of the city will suffer from it.

In truth the construction of the Broadway surface road is responsible for this sudden awakening. The enormous profits which this road will unquestionably earn, the ease with which its franchise was obtained from the board of aldermen and the unwholesome scandals attending it have done much to unsettle the public mind, and two strong parties have been developed—the street-railway party and the anti-street-railway party—the first rushing hastily into any wild speculative street-railway project and the latter unreasonably opposing any contemplated street-railway construction.

For the true benefit of street-railways in this city there should be two policies pursued. There should be a searching investigation into the circumstances attending the granting of the Broadway franchise and a temporary cessation of street-railway construction until the public mind crystalizes and it can be ascertained what the city really needs. From the GIBBS committee there is little to expect. It is composed in part of the lowest order of machine poiticians, and the shifting, evasive action of its chairman on the question of examining the granting of the Broadway franchise betrays a desire to avoid the subject altogether. In all probability the incoming legislature will appoint a new committee and the matter will be thoroughly sifted, for the public mind is so aroused that the Albany solons will not dare refuse to investigate the subject.

Regarding the second step—a cessation of street-railway agitation—there is reason to believe that it will take place, owing to the strong opposition that the public is showing to the free bestowal of franchises; and when affairs have been straightened out, and the public and the street-railway projectors can agree, we may look for some wholesome activity in street-railway construction in this city.

WE present this month the first of the reports of special committees submitted at the recent convention of the American Street-Railway Association. It is a careful analysis of the vexed questions appertaining to the establishment of rules for the guidance of conductors and

drivers, and its conclusions are the results of the long experience of several prominent street-railway officials. As such it will merit attention. The remaining reports will appear in the JOURNAL in as short a time as possible, and when they are exhausted the reports and papers read at the recent convention of the Ohio State Tramway Association will be given space. Altogether there is a large fund of instructive matter in store for the street-railway readers of the JOURNAL.

* * *

THE first street-railway in the state of Vermont was opened for passenger-traffic at Burlington, on November 13th. There has been a race between Burlington and Rutland to achieve the honor of opening the first street-railway in the commonwealth, and Burlington has won, though the Rutland road is announced as approaching completion. This rivalry is very pleasant and commendable, but it strikes us as a little singular that so old a state as Vermont and one so comparatively thickly settled should be without a convenience that is common to every little one-horse town in other states.

THE FUTURE OF THE CABLE SYSTEM.

BY A. J. MOXHAM.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT has almost become an axiom that none but the giants among street-railways can afford the cable system. Its first cost is almost prohibitive. The recent history of its development seems to support the axiom. During the last few years it has been introduced on the level streets of Chicago, St. Louis and Philadelphia, justified by heavy passenger-traffic, either promised or existent, and into Kansas City, Cincinnati, and on Tenth avenue, New York, necessitated by heavy grades. In Chicago the type of construction adopted was what is known as the Hovey modification of the Hallidie system, and all others embody the same main features. In Philadelphia the modification is known as the Bonzano system, in New York and Kansas City as the Miller, in St. Louis as the Boyer, and in Cincinnati as the Lane. Of them all the type of construction as worked out in the Lane system in Cincinnati is perhaps the most thorough, mechanical and economical in first cost.

The cost of these roads completed, exclusive of power, station and equipment, will average not less than $75,000 per mile, single-track; the extremes being in Chicago, a cost of $105,000, per mile and Cincinnati, where timber was used for the conduits, about $40,000 per mile.

I do not purpose in the following lines to take the part of *primo uomo* on behalf of the present cable system, though a firm believer in its outcome. I purpose to dwell upon the hope that there is in this outcome by taking a pessimist rather than an optimist view of the system of to-day. To those who have not investigated the system thoroughly, its first cost is a matter of astonishment. To those who have done so, it is rather a warning to wait—to "bide the good things coming." *It is, on its face, a false cost.*

Let us take $75,000 per mile of single-track as an average. Let us assume that a horse will average 16 miles a day at a speed of 7 miles an hour and the cars are run with a minute-and-a-half headway for 16 hours a day, all of which is excessive. A cable on a mile of such track will replace 80 horses. I confidently assert that in no other known instance of general use, either in mechanism or construction, does it cost as much money to mechanically replace 80-horse power.

The present system may be defined as a very small cable running through a very large hole; and that very large hole can best be described as running through the investor's pocket-book.

There are three considerations which principally govern the size of the conduit:

1. Capability to properly carry the distributer of power—the cable.
2. Capacity enough to provide for drainage.
3. Capacity for passage of the car-connection.

We will look at these:

1. Passage of the cable.—On the face of it a small requisition. It is only necessary to provide clearance for the natural dip of the cable between pulleys, and this, in its turn, is capable of control by means of driving and tension apparatus which can be increased if desired in numbers, in tension, or in both.

2. Drainage.—Also, as compared with the size of the present conduit, a small factor, and one for which we have a precedent in the street gutter. As the conduit is itself sub-drained by connections to the main sewer, which can be made at frequent intervals, greater capacity is not called for; certainly not for liquid drainage, and as for solid obstruction it must be remembered that the nearer the surface the more easily is such obstruction handled.

3. The car-connection.—This at present is the main cause of the large conduit. In the present system it consists of vertical shanks passing through the slot and connecting with the cable by a complicated enlargement inside the conduit. As I before stated, I will not go into details of construction but rather seek broadly to learn its promise.

Size has in this case been the result of its complication. Is is well to note that the grip of to-day was originally of small compass and simple construction. Piece by piece has it been added to and built up. Its many parts have contributed to a great weight; that weight by an increase in the inertia of the grip contributes to excessive side wear during passage through the slot, which in turn demands provision for that wear. There seems little hope of decreasing either the size or the weight of the present type of grip. The tendency seems rather to further increase. It would seem that this alone would tend to stamp the present grip-connection as faulty in its conception.

Again, arguing *a posteriori*, let us ask if all this complication be needed, why locate it where of all places it will cost most money? That many points have to be cared for in *any* car-connection, no matter what the system, no thinking man will deny. It must be more or less flexible, it must be capable of an adjustment independently of the car, of rapid separation and entire detachability from the cable. Indeed before it can be pronounced thoroughly

successful we must go a long stride ahead of the present grip, and make it entirely detachable from the slot and conduit at any point in its travels. But cannot all this be done without putting the vital and complicated parts *into the conduits?* It costs nothing for space if carried in the open; the weather wont worry it. Then why go to the expense of constructing a big hole in the ground to keep you from taking care of it? Providence never yet put a man's brains into his belly. The advocates of what will soon be known as the "old school" (but not "of Masters") urge that it will not do to lift the cable out of the slot, so the grip must go to the cable. Very true. "As the mountain won't come to Mahomet, Mahomet must go to the mountain." But unfortunately the present system makes a mountain out of the grip and upsets the Koran by sending it to Mahomet after all. To contend that these rational changes *cannot* be effected, seems to me a libel on the inventive skill of the most inventive people on the globe; and to urge that they *will not* be effected when conducive to so much economy, a libel on the thrift of our capitalists, lack of which is not one of their characteristics.

I have thus criticised the grip of to-day because, as pointed out, it seems to be the *pons asinorum* of the present system. This reduced within reasonable and mechanical limits permits of a smaller conduit, and with this the real economy available stands revealed.

There is one limit to the depth of the conduit, to which the practical and economical instincts of the street-railway man turns, as does the Mohammedan to Mecca. *It should not interfere with or cut through the cross-ties.* And so far as the future development of the system is concerned there seems no vital impossibility in carrying through these reforms.

One word as to the cable itself. So far it has cost about $1,200 per mile of single-track and lasted an average of about 15 months. In a line 20 miles long, this is an addition to yearly operating expenses of $19,200 per annum. At 8 per cent. interest it would pay to invest one hundred and twenty thousand dollars to make this cable last twice as long, and one hundred and eighty thousand dollars to make it last four times as long. There is one fact patent in this connection. It is that the use of a cable for street-railway service subjects it to totally different treatment from that of any other use it is put to, and consequently it demands and will doubtless evolve a cable of a new and different type—one that will meet the special requirements of this use.

There are many who, at first enthusiastic in their hopes about the system, have lost all interest in it on learning its great first cost. To such I would urge that there are two powerful stimulants tending to reduce the cost to such a point as should renew their interest:

1. The system is costing $50,000 per mile more than it should cost, and there is consequently a standing premium of $50,000 acting as an incentive to cut down its cost to a normal figure.

2. It is the right thing and wanted badly. There is an appetite for it.

In his "Noctes Ambrosianæ," John Wilson thus speaks through two of his characters:

Tickler (who has the blues).—I wish I was dead.

Shepherd of Ettrick.—You dinna wush ony sic thing Mr. Tickler. That appeteet o' yours is worth five thousan' poun' a year. O mon, it would be a sair pity to dee wi' sic an appeteet.

So with the cable system, there is an appetite for it. "It would be a sair pity to dee wi' sic an appeteet."

And it won't.

RULES GOVERNING CONDUCTORS AND DRIVERS.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

EVERY street-railway enterprise is dependent for its success upon its location and management, and the management is very largely dependent for its success upon the character and conduct of the conductors and drivers employed.

These servants are the real representatives of the company before the public, and just in proportion as they are civil, polite and attentive, or the reverse, will the company obtain favor or disfavor with the public. They are also the trusted servants of the company for its revenue and upon their watchfulness, fidelity and honesty depends in a great measure the financial success of the enterprise.

It is, therefore, of the utmost importance that good men should be selected for these positions, and equally important that good rules and regulations should be the guide of their conduct—such rules as will commend themselves to the judgment of reasonable men, and such as will conduce to the orderly conduct of the business and the comfort, convenience and safety of the public; not only that portion which rides in the cars, but of the large number of pedestrians and teamsters. The streets are for the whole public, and while the street-car is given by law the right-of-way it should always be taken in the least objectionable manner consistent with a proper conduct of the business.

To one who has examined the rules in force in different sections of this vast country, it is obvious that no complete set of rules could be drafted which would meet the local requirements in all respects, and no attempt at such a compilation will be made by your committee, but its recommendations will be confined to such general regulations as seem, from a careful survey of the subject united with a long experience, to be applicable alike to all sections.

The rules should be made as concise and as complete as possible, should be issued in convenient form to be carried in the pocket, and as discipline is one of the first essentials in the correct management of any body of men they should be rigidly enforced. It should be made obligatory upon the men to carry the rules at all times when on duty. Ignorance of a rule should be no excuse for its violation, and wilful or careless violation of their provisions should be made sufficient reason for their discharge.

Rules are are properly divided into three classes, viz.: *Discipline and Deportment; Comfort, Convenience and Safety of the Public*, and *Collection of Fares*, and we shall treat them in that order:

DISCIPLINE AND DEPORTMENT.

The conductor should have charge of the car and any disobedience of orders or infringement of the rules on the part of his driver should be reported.

Starting behind time, loafing or too fast driving, driving fast in going on or off turnouts, around curves and over railroad crossings; failure to answer the bell promptly or to stop the car properly; stopping the car

across intersecting streets or over cross-watks; failure to keep a sharp lookout for passengers in main and cross streets; failure to signal promptly and accurately for passengers who get on at front end of car; carelessness in driving; permitting unauthorized persons to drive; the use of profanc, boisterous or indecent language, or the use of intoxicating liquors are all matters which a conductor should promptly report to relieve himself from responsibility.

As it is important that these employés should be neatly dressed, and as taste in the matter of dress differs so radically, it will be found advantageous to prescribe some neat uniform to be worn at all times when on duty. This will add not only to their general appearance, but to their efficiency as well. A numbercd badge should be worn at all times when on duty and in a position to be plainly visible.

They should treat each other with respect, be cautious and considerate, guarding themselves against envy, jealousy, or other unfriendly feelings, refraining from all discreditable communications except to those in authority and upon such matters as it is made their duty to report. They should use no vulgar, profane, improper or ungentlemanly language, nor be guilty of any ungentlemanly conduct upon the car to passengers or others, nor upon the company's premises.

They should be civil, courteous, polite and attentive to passengers at all times, be patient and answer any reasonable request of passengers, and direct strangers and others when requested the nearest and safest way to their place of destination. They should abstain entirely from the use of intoxicating liquors, and should not frequent any place where the same are sold. They should not accept any fee, gift. treat or entertainment of any kind from each other or from any employé of the eompany. They should attend punctually at the stable to take out their cars, remain with them at all times when *en route*, conform to the running time as near as possible and always stop and start the car by the prescribed signal. The signal in most general use is one bell to stop and two bells to start, and upon open cars it is customary and advisable to permit the use of a whistle for signals. The driver should signal the conductor by one bell for each passenger getting on at the front end after the first collection of fares. Other signals for putting on the rear brake, for increasing speed or to stop suddenly are usually provided for and will be found useful in an emergency. Every conductor should carry a watch, keep it exact with the office time and start his car from each terminus promptly at the advertised time.

Thc proper position for a conductor when not otherwise engaged in the performance of his duties, is upon the rear platform, standing erect and on the watch for persons desiring to take the car. He should not engage his attention in reading, in unnecessary conversation with passengers, nor in any way which would interfere with a correct and prompt performance of his duty.

The driver should stand erect with right hand on brake-handle, controlling his horses with a taut rein, keeping a vigilant watch for persons who may desire to take the car, not only in the main but in side streets, and at the same time with a careful eye to avoid collision with pedestrians or vehicles, and should always speak pleasantly to teamsters when requesting them to move. They should both be ever on the alert to advance the company's interests and always ready to assist each other in any emergency. Cars when heavily loaded should not be stopped on steep grades nor upon curves, except to avoid accidents. Jumping cars from the track should not, as a rule, be allowed; on a single-track it is more advisable to change cars or to run back to the nearest turnout.

When necessary to eject a passenger for any cause, the aid of a police officer should be employed if possible. No more force than is absolutely necessary should at any time, in such cases, be used and the names of reputable witnesses should be obtained. Suitable blanks should be furnished to be filled out in case of accident, and upon which a full statement should be at once written and delivered promptly at the office. Articles found in the car should be promptly turned in at the office with accompanying memorandum giving particulars.

SAFETY, COMFORT AND CONVENIENCE OF THE PUBLIC

The conductor comes in more direct contact with the public than the driver, and while many rules are only applicable to him the driver should should at all times coöperate with the conductor, as far as he can, in carrying out the rules in their spirit and intent.

The car should be kept clean and the lamps trimmed at all times, but it will in most instances be found more advisable to provide special labor for this purpose rather than to make it a part of the duty of the driver and conductor. Special assistance should be given to ladies, children, and elderly or crippled persons getting in or out of the car. Seats should always be provided as far as possible. During cold and stormy weather the doors should be kept closed as much as possible. The rear platform should be kept as clear of passengers as possible and children should never be allowed to ride upon either platform. Passengers should not be allowed to stand in the doorways or upon the steps when it is possible to avoid it. Passengers should be requested to alight at the rear end from the side nearest the walk. When a lady leaves the car, care should be taken to observe that her dress is entirely clear from the platform and step before giving the signal. Whenever the car is stopped at the request of any passenger, care should be taken to observe that every other person upon the car is in a position of safety before giving the signal, and passengers should be cautioned and prevented as far as possible from leaving a car while in motion. Expedition in receiving and landing passengers is always desirable, but never at a sacrifice of safety to individuals.

Disorderly or otherwise obnoxious persons, whether or not under the influence of liquor, should not be allowed to ride upon a car, and any one perceptibly under the influence of liquor should never be permitted to ride upon the front platform.

Smoking, the carrying of dogs, and the distribution of hand-bills and peddling in the cars, are all matters which should be regulated by rule. The names of principal streets, hotels, depots, ferry landings, public squares and places of amusement should be distinctly announced as the car reaches them. Provision baskets or soiled and greasy bundles should not be allowed inside a car, and not outside to the inconvenience of passengers or injury to cars. Nothing should ever be hung upon the rear brake-handle. The car should always be stopped a reasonable distance before crossing a steam railroad track at grade, and the conductor in the absence of a flagman should go forward and give the signal to the driver to advance. If inside the car, the signal to go ahead should not be given without inquiry if all is right and receiving an affirmative answer. Passengers should be notified of any approaching danger, as an obstruction in the street.

The liability to accidents on open cars is much greater than on box-cars, because of so many places of entrance and exit, and consequently the very highest degree of care is necessary when running them.

COLLECTION OF FARES.

There are probably few if any companies to-day who do not provide some sort of registering device to be used by the persons responsible for the collection of fares, and the rules governing the collection will depend upon the device used.

As a rule, the conductor should commence to collect fares at the front end and work to the rear. After fares have been once collected the driver should signal by one bell for every person getting upon the front platform, and additional fares should be collected as soon as passengers reach the place in the car to which they intend to go.

Each fare should be registered at the exact place where it is taken, in the presence of the passenger paying it and before another is collected. Where fare-boxes are used the driver is also the conductor and should not be permitted to handle the fares, but should see that every passenger's fare is deposited in the box.

Having completed a set of rules to his satisfaction no railroad manager should stop there; rules, no matter how good, will not enforce themselves, but the better the class of men employed the easier will it be to enforce good rules.

Drivers and conductors should be not only faithful but intelligent, for they are very often called upon to use discretion in matters which it is impossible to cover by the rules.

As far as possible these employés should be selected from among the residents of the city or town in which the road is located, and such as are favorably known and endorsed by reputable citizens of the town. When first employed they should not be less than twenty-one nor more than forty years of age, energetic and of good habits. The pay should be sufficient to attract and hold such men, and their hours of labors should be fixed within the bounds of reason.

Fourth Annual Meeting of the Ohio State Tramway Association.

THE fourth annual meeting of the Ohio State Tramway Association was held at the Boody House, Toledo, Ohio, on November 18th, under the auspices of the Consolidated Street-Railway Company, of Toledo, and was a most successful gathering. Delegates were present representing street-railways in Cincinnati, Dayton, Springfield, Columbus, Cleveland and Toledo. The meeting was thoroughly interesting and the papers read, as announced in the September JOURNAL, exceedingly valuable and in-

structive. Resolutions were adopted calling for information and statistics on: "Amount, Kind and Frequency of Feeding Horses," "Causes of Accidents"—for classification, to guard against recurrences of them, and "Insurance Premiums and Losses." Through the courtesy of Secretary Richardson of the American Street-Railway Association full information was furnished on the latter subject.

The following officers of the association were elected for the ensuing year:

President, C. B. Clegg (secretary, Dayton Street-Railroad Company, Dayton); Vice-President, Joseph Stanley (vice-president and superintendent, Broadway and Newburg Railroad Company, Cleveland); Secretary, H. A. Everett (secretary and treasurer, East Cleveland Railroad Company, Cleveland); Treasurer, W. B. Hayden (director, Columbus Consolidated Street-Railway Company, Columbus); Executive Committee, the above-named officers and A. E. Lang, (secretary, Toledo Consolidated Street-Railway Company, Toledo).

The banquet of the association was held at the Boody House in the evening, at the conclusion of which the convention adjourned to meet in Dayton, Ohio, on Wednesday, November 17th, 1886.

The Philadelphia Electric Railway.

THE American Electric Railway Company, of Philadelphia, which has lately laid a line along Ridge avenue from the depot at Thirty-fifth and Dauphin streets to West Laurel Hill, made an experimental trip on November 28th. The new car, fitted with the electric motor, ran out of the depot and made a perfectly successful run to the end of the road and back to the depot.

A Cable Road in Binghampton, N. Y.

THE street-car line extension at Binghampton, N. Y., to the State Insane Asylum in that city was opened recently. The cars are drawn up a steep bluff by a cable and a speed of twelve miles an hour was obtained. The system differs from the usual cable roads, there being two cables in use and no grip being required. The inventor is Mr. C. B. Fairchild, a teacher in one of the New York public schools, and the system has been pronounced a decided success.

A Street-Railway in Newport, R. I.

A CHARTER has been obtained and the privilege of laying tracks for a street-railway asked of the city council of Newport, R. I. New York and Boston capitalists, representing about $40,000,000 of real estate in the city, protest against the line as injurious to the city's interests, and threaten to quit if it is built; certain carriage owners have also stated that they will not use streets where rails are laid. The city council will submit the question to the voters at large. Thc newspapers and most of the citizens are in favor of the railway.

The Brooklyn Elevated Railway.

THE first quarterly report of the Brooklyn Elevated Railway Company shows an income of $94,824.35, and expenditure amounting to $79,399.14. The railway was not completed to the Fulton ferry until after the close of the quarter. It is now doing better than before, although it does not run through the principal business portion of the city. The fare is five cents at all hours of the day or night. The company owning this small elevated road in Brooklyn are so well pleased with its success thus far, that they are trying to get the right-of-way to build two more lines in that city.

A London Tramway.

THE mileage of the North Metropolitan Tramway Company, of London, Eng., is 33¾ miles; for which there are are 220 cars, 2,000 horses, and 1,000 employés.

STREET-RAILWAY NOTES.

WORK began this month on the Chambers and Grand street Ferry Railroad in the lower part of New York City, and the track-construction was being rapidly pushed until a temporary injunction was granted by the courts on motion of the New York Cable Railway Company, who claimed that the former company were infringing upon the latter's rights and franchises. The injunction has since been dissolved.

THE Chicago Passenger Railway Company opened its line recently. It runs on Adams street from Park to Desplaines, thence south to Harrison, thence west to Western avenue. The company is running twenty-four cars morning and evening and twelve during the day, and expects to increase this number at an early date. D. L. Hough, of Chicago, is president of the company.

THE Van de Poele Electric Light Company, of Chicago, is building an electric street-railway at South Bend, Ind., and has a contract for a similar road in Detroit. It has also contracted to supply electric motors to the Minneapolis, Lyndale and Minnetonka Railroad to operate the portion of its line within the city limits.

GROUND has been broken for the construction of the Mount Vernon and East Chester Surface Horse-Railroad to connect the Harlem and New Haven Railroad and so on to its terminus at the East Chester dock, near Pelham bridge, a distance of three miles.

THE City Railway Company, of Trenton, N. J., opened its new road for operation this month. The new road branches from the main line and runs down Center street to Riverview.

THE Rutland (Vt.) Street-Railway will soon be built. Nearly all the $28,000 in bonds are disposed off, 200 tons of steel rails are ordered, and cars are being negotiated for.

IN the department of New Inventions of this month's JOURNAL will be found descriptions of a switching-wheel for street-cars, a cable-grip, and an improved car-strap.

THE Waterloo (Iowa) Street-Railway was opened November 6th. It was intended to be operated by electricity, but this has been found to be impracticable.

THE Little Rock (Ark.) Street-Railway Company has purchased the Citizens' Railway for $100,000. The completion of the new line is now assured.

WORK on the street-railway at Tampa, Fla., was commenced November 16th.

PALATKA, Fla., is to have a street-railway.

New Inventions.

Adams' Car-Brake.

GILBERT L. ADAMS, of Altoona, Pa., is the inventor of an improved car-brake, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a plan view of a car-truck fitted with the improved brake appliances; Fig. 2 a longitudinal sectional elevation taken on the line *x x* in Fig. 1, just at one side of the central pivot-block or fulcrum, which is attached to the central spring-beam of the truck, and Fig. 3 a front elevation of the spring-beam and the brake devices, the wheels and other parts of the truck being removed for the sake of perspicuity. In this view are clearly shown the fulcrum-plates of both primary and secondary levers, and also the vertical arms to which the brake-shoes are attached. The brake-shoes are removed in this figure, as well as parts of the truck. Fig. 4 is an elevation of the brake-shoe detached from the other parts, and Fig. 5 a detailed view

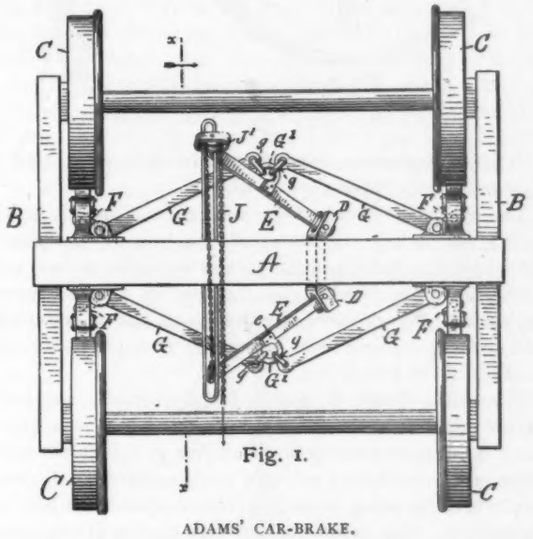


Fig. 1.

ADAMS' CAR-BRAKE.

showing a side elevation of the brake-shoe and the vertical arm to which the shoe is hung, the two parts coupled together as in use.

The truck, as is usual, has a central bolster or spring-plank A, made either in one or two parts, with end frames B, in which the axles of the wheels C, have their supporting or bearing-boxes. To the central part of the beam A, near its bottom edge if there is only one beam, or if there are two near the bottom edge of the lower beam, is secured a fulcrum-block D, one on each side of the beam, to which fulcrum-blocks are pivoted the lower ends of the two actuating-levers E. There are also secured to each side of the beam A, just inside of the wheels, two vertical arm-pieces F, one near each end of the beam. These arm-pieces provide fulcrum-blocks for the secondary levers G, as shown in Figs. 1 and 3, and also, by means of their upwardly-extending arms, attachment-supports for the brake-shoes, as shown best in Fig. 5. The brake-shoes H, are hung to the upper ends of the arm-pieces F, either by links I, as shown in Fig. 2, or, in lieu of them, an arm or connection-piece cast solid with the brake-shoe. In either case the brake-shoe is allowed a swinging or pendulous movement on the coupling-pin or pivot *i*, on which it is suspended at the top end of the arm F. The rear or outside of each brake-shoe has a pair of lugs *h*, extending rearwardly, and a small slot formed between these two lugs forms the seat of the secondary lever G. The free or moving ends of the levers G, on each side of the beam A, are coupled in an assembling-clevis G', by a pivot or coupling pin *g*, and a slot in the other side of the

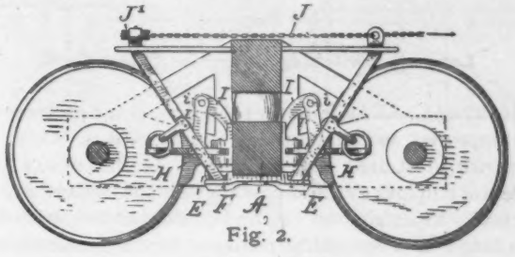


Fig. 2.

ADAMS' CAR-BRAKE.

assembling clevis-piece receives the actuating-lever E, which is connected to the clevis-piece by an assembling-bolt *e*.

As shown in the cuts, the actuating-lever E, coupled with the secondary levers G, form a set of compound levers for applying pressure to the brake-shoes. There is one of these sets of compound levers on each side of the central beam A, as shown in Fig. 1. The two sets of compound levers are actuated simultaneously, so as to apply all of the brakes of a single truck to the wheels of that truck at the same moment. For this purpose an operating cord, chain, or rope I, preferably of wire, is attached to the top end of one of the levers E, and is thence taken over to and run around a sheave J', attached to the top end of the other actuating-lever, and thence it is conducted back to the operating brake-rod, (not shown), and by tightening up the cord or chain J, the levers E, are both drawn together, and thereby move the coupled secondary levers G, so as to apply all of the brakes simultaneously.

The fulcrum-pieces D, and the clevis-pieces G', have several holes formed through them for the accommodation of the assembling-pins or bolts to several different positions, so as to form an adjustment or take-up for the parts as they become worn by use.

Fig. 3. Fig. 4. Fig. 5.

ADAMS' CAR-BRAKE.

The advantages of this brake over other brakes are claimed to be: 1. The elevation of the brake above the track or road-bed, being eight inches higher than that of any other brake—thus avoiding obstructions on the road-bed. 2. If any part of this brake, or if the whole brake, should be detached or torn off, no damage could happen as on other brakes. 3. The power gained by the use of the combined levers, etc., is claimed to be at least three times greater than that of any other brake, and a brakeman can handle the brake with but one hand. 4. The

shoes wear uniformly and are kept perfectly solid on the tread all the time, thus saving many shoes—other brakes wear the shoes uneven and making them useless. 5. The repairs to this brake will be required much less frequently, and when necessary can be made at much less expense.

The device is now controlled by the inventor and by Messrs. Alexander & Herr, of Altoona, Pa., to whom one-third the patent-rights have been assigned and to whom all communications should be addressed.

Lowrie's Switching-Wheel for Street-Cars.

HARVEY C. LOWRIE, of Denver, Col., is the inventor of an improved switching-wheel for street-cars, which is herewith illustrated and described. In this device the inventor employs a switching-flange or flange-wheel which is readily adjustable on the line of the car-axle, whereby the flange, as a switching medium, may be rendered inoperative, or if organized, for instance, to turn a car to the left hand, it being assumed that the road on which the car travels is provided with frogs adapted to coöperate with the properly adjusted switch-wheels. In what is deemed its best form the adjustable switch-wheel em-

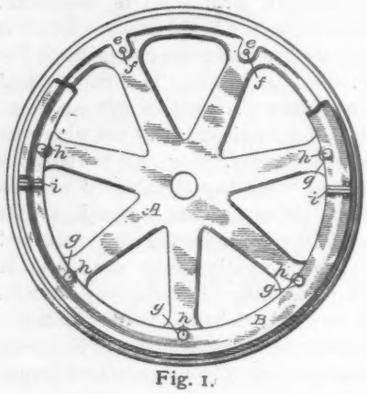


Fig. 1.

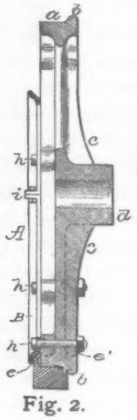


Fig. 2.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

bodies an ordinary car-wheel, so far as flange and tread is concerned, but having at its inner and outer sides a plain annular surface, near its periphery, pierced with lateral bolt-holes, and a switch-wheel flange, which is capable of being operatively applied to either side of the car-wheel and to be securely bolted thereto, thus providing for the adjustment of the switch-wheel flange longitudinally on the line of the axle to the extent of the thickness of each wheel, and this can be readily supplemented by the interposition of rings of different thicknesses between the detachable flange and the wheel. With this construction and switch-flanges of various diameters, aud obvious corresponding variations in the rail-frogs of a street-railway system, it will be seen that any car can in a few minutes and with but little labor be adapted for service on any route.

As an equivalent for the construction stated, so far as convenient shifting is concerned, it will be sometimes found desirable to provide a switch-flange with a hub of its own, and mount it upon an axle inside of the car-wheel; but such would not embody the improvements unless it were so mounted upon the axle—as by a set-screw and key for instance—that it could be readily adjusted longitudinally on the axle.

In the accompanying cuts, Figs. 1 and 2 illustrate in side view and section a car-wheel provided on its outer face with a switch-flange. Figs. 3 and 4 in similar views illustrate a car-wheel with the switch-flange applied to its inner face; Fig. 5 is a plan view of one form of frog adapted for use with switch-wheels; Fig. 6 and 7 are enlarged views of portions of the frog, and Fig. 8 is a sectional view of a switch-flange provided with its own

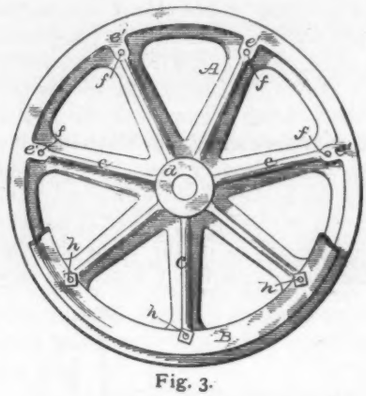


Fig. 3.

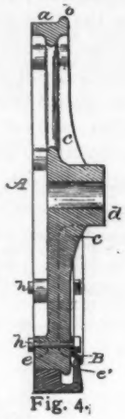


Fig. 4.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

hub, and illustrates a method of adjustably mounting it on a car-axle between the car-wheels.

The car-wheel A, has the usual tread *a*, flange *b*, inside webs *c*, and hub *d*. On its outer side, near its periphery, the wheel has a flat annular face or series of faces *e*, and a series of lateral bolt-holes *f*, at proper points around the wheel. On its inner face the wheel has a similar flat face or faces *e'*, these seats being the best points for the location of the bolt-holes.

The switch-flange B, may be largely varied in its peripheral contour without departure from the invention; but it must have a series of bolt-holes *g*, coincident with those on the car-wheel, and a fit surface near its periphery to admit of its being properly clamped upon the wheel by the bolts *h*. The switch-flanges may be cast in one piece or made in two or more segmental sections; but it is preferable that they be made in two parts, as shown, and formed of so-called "malleable iron," or of wrought iron or steel, and provided with lips *i*, at the joints, and tie-bolts, as shown, for greater convenience in handling, incident to their adjustment.

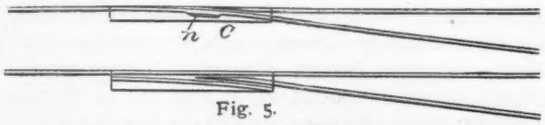


Fig. 5.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

In Fig. 8 the switch-wheel B, has its own web and hub, and is mounted on the car-axle *k*, so as to be readily adjusted longitudinally thereon. The eye of the wheel is large enough to receive the axle freely, and also to receive the key *l*, and in its hub there is a set-screw *m*. Other means for locking this flange-wheel to the axle may be employed without departure from the invention, but they must be such as to enable variations in adjustment to be made with facility.

It will be seen that by loosening the set-screw the key can be readily withdrawn, and for securing the wheel the set-screw is first turned partially into contact with the axle and the key is then driven into its seat; but it cannot be so firmly set that it cannot be readily released on turning back the set-screw.

With the detachable and adjustable switch-flanges or the flange-wheel, as shown in Fig. 8, the frogs would in each case be constructed so as to coöperate with the particular adjustment. As, for instance, if a branch track were entered toward the right hand, as seen in Fig. 5, the

Fig. 6.

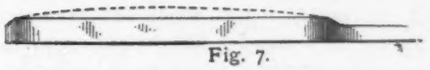


Fig. 7.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

switch-flange B, would be located on the outer side of the right-hand front wheel of a car, and when the frog C, was reached, its curved web *n*, would be engaged by the wheel-flange and cause the car to pass the frog properly. A second switch-flange on the inner side of the left-hand front wheel might be also used with a frog on that side of the track, similarly provided with a guiding-rib; but one flange and rib is usually deemed sufficient.

It will be readily seen that when cars must be temporarily run over routes other than regular it will be an easy matter to adapt them to any given route if the rolling-stock superintendent be provided with a schedule giving the number or size of the particular flanges required for each turnout on all the routes; and it will be equally

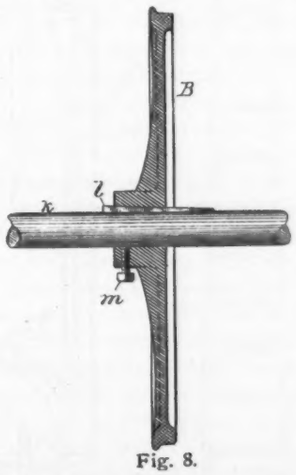


Fig. 8.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

obvious that if both sides of the wheels be provided with switch-flanges a car will readily turn into properly constructed frogs, whether toward the right hand or the left, thus providing for all possible contingencies. A car whose forward right wheel was flanged outside might be turned to the right at one place, while a car whose forward left wheel was flanged inside might pass such turnout, to be guided to the right at some further turnout as desired, and so on.

Cuneo's Car-Coupling.

JOHN CUNEO, of Vicksburg, Miss., is the inventor of a new form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a bottom plan view of two of the couplings properly engaged; Fig. 2 a partial side and sectional view thereof, and Fig. 3 a top plan view of one of the couplings.

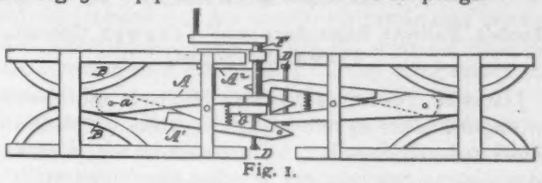


Fig. 1.

CUNEO'S CAR-COUPLING.

The coupler consists of two arms A A′, of which the left A′, is mortised into the right and fastened thereto by a pin *a*, a foot or two in front of the end. The rear end of the right arm rests between two arcs of circles B B, connected with and being part of the frame, and to which it is fastened by a pin *b*, which passes through both arcs and through a hole mortised in the rear end of the arm, and which holds it steady in place.

In the extreme rear end of the right arm is a steel-spring C, which passes through and is securely fastened to a cap, which is held firmly in place by being mortised into the arc of the circles on either side. The object of this spring is to give play to the arm and to prevent injuries from the

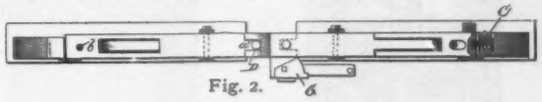


Fig. 2.

CUNEO'S CAR-COUPLING.

cars when coupling or uncoupling. The front has two jaws, and just in the rear of the jaws a pin D, through the two arms, which is caught in the teeth of the coupler and held steady in place. Just in the rear of the pin is a steel-spring E, which holds the two arms or jaws together and position.

F indicates the lever or windlass by which the cars are unlocked or uncoupled. This shaft is journaled in the arm A, and in a bearing-support A^2, supported by the arm, and just below the jaw of the arm A, the shaft is provided with a cam or wedge-block G, arranged to operate close to the jaw of the arm A, and to detach therefrom a similar jaw, which has been engaged therewith, as shown in proper in Fig. 1.

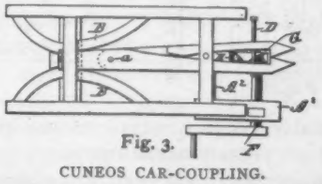


Fig. 3.

CUNEOS CAR-COUPLING.

It will be noticed that the inner faces of the ends of the arms are shouldered, while their outer faces are unshouldered, so that when the engaged jaws are forced apart the uncoupling is completed and there is no danger of another set of shoulders engaging.

It will also be seen that the uncoupling is positive, the parts being detached and forced out of engagement. The forward ends of the arms are slotted at *a′*, for a double

purpose. In the first place they are thereby adapted to couple with a car using the common link-coupling, while at the same time this slot, fitting over the pin D, prevents the jaws when coupled from becoming detached by independent vertical play.

The inventor claims for this device simplicity, durability and efficiency in coupling.

Toole's Railway Semaphore and Telegraph Operator's Train-Order Signal.

JAMES N. TOOLE, of Jackson, Mich., is the inventor of improvements in railway-signals, which are herewith illustrated and described. The object of the inventor is to provide signals that can be relied upon in all kinds of weather and at all times, and also to reduce the cost of such devices to the lowest figure.

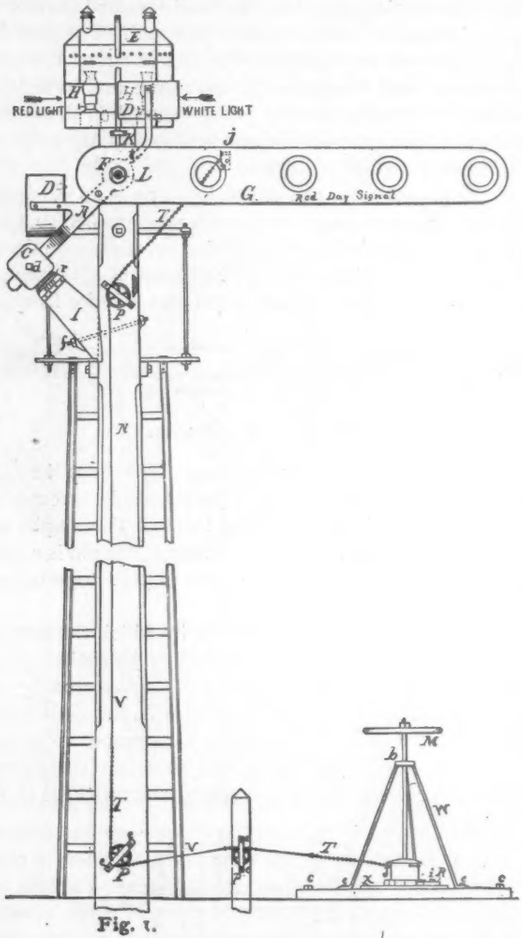


Fig. 1.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

In the accompanying cuts, Figs. 1, 2 and 3 refer to the semaphore, and Fig. 4 to the telegraph operator's train-order signal.

Fig. 1 is a vertical view of the long-distance semaphore ready for operation. The device is mounted on a pole N, which can be any height desired, and is operated by turning the brake-wheel M, which turns the drum J, and causes the rocking-shaft L, to turn in the box F, and the counter-balance weight C, to rise to an angle of forty-five degrees. This turns the screens D D, over one-fourth and covers the exposed (or danger-signal) light H, and discloses the other light which gives the signal "all right" in the night. By this movement the target-board G, is pulled down, from horizontal (or danger-signal) to a perpendicular position, which gives the signal "all right" in the day.

Fig. 2.

Fig. 3.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

The device can be set for danger-signal instantly by kicking off the ratchet-dog R, which lets the weight C, descend to the weight-stop I. This weight-stop I, is provided with a rubber-spring *r*, which works perfectly, as it weakens the force of the blow when the weight C, comes in contact with the stop I, and prevents all bad effects that would be likely to occur from the jar of the weight C. Small chains T T, are used over the pulleys P, when it is necessary to turn angles. No. 8 wire V, is used to connect the device at the ring *j*, with the ratchet-drum J. The wire V, can be one mile in length, more or less, and can be run over high posts when it is necessary to cross highways or railway-tracks.

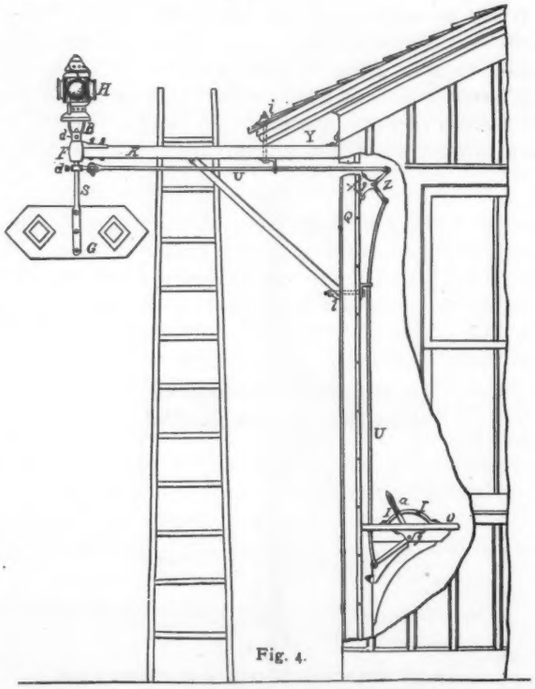


Fig. 4.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

The inventor believes that kerosene oil can be used with better results when the ordinary glass-lamp chimney is used, and for this reason he has provided the lamp-case E, in which he uses two common tin hand-lamps H H. The lamp-case E, is made of tin, and the glass that surrounds the lights slides in grooves on the inside. This glass can be of any color desired, and is arranged so

that it can be changed or replaced in a moment's time. The lamp-case E, can be reached with ease from the platform at the top of the ladder, and it lifts off the pole N, as shown at K. The whole case E, weighs about ten pounds and can be conveniently taken into the station-house to trim the lamps and put them in order.

Fig. 2 is an end view of the lamp-case, and Fig. 3 an end view of the screen. The lamp-case E, is very narrow, which brings the light close to the glass at front and back, making the light visible from all directions except a small space directly toward the screened light and at right angles to the track. This lamp has been tested during the fiercest storms, and gives entire satisfaction.

The inventor claims for this device simplicity, strength, durability and economy.

Fig. 4 is a vertical view of the telegraph operator's train-order signal. The fore-arm K, is firmly secured to the telegraph office, as shown at Y. To the end of the fore-arm is attached the circular-box F, and the fork B, is secured on the top of the shaft by the set-screw *d*. The signal is connected with the operator's table O, and the lever *a*, by the rods U U, and the angle-irons Z. To operate the signal the lever *a*, is pulled back to the hole I, in the circle on the table O, and by this movement the shaft S, is turned one-fourth around and the signal "all right" is shown. The lever *a*, is provided with a spring bolt-lock that catches in the holes I I. The holes in the circle are the stops for the device, and the lock being always in either hole the signal must show either "danger" or "all right."

The inventor claims this device to be simple, inexpensive and efficient.

Long's Lubricator.

JOHN M. W. LONG, of Hamilton, O., is the inventor of an improved lubricator, which is herewith illustrated and described. The invention has reference to that class of lubricators in which the lubricating material is contained within a cylindrical cup and pressed upon by a spring-loaded piston fitted to be adjusted by means of a screw.

In the accompanying cuts, Fig. 1 is an elevation, and Fig. 2 a vertical section of a lubricator constructed according to the invention.

A is a cylindrically-bored cup provided with a shank adapted to be threaded, so as to be inserted into an engine crank-strap, journal-cap, and all kinds of bearing to be lubricated; B is a removable cap attached to the top of the cup, as by being screwed thereon; C is a hollow boss formed upon and projecting from the top of the cup and arranged in the line of the axis of the bore of the cup; D is a piston, fitting within the bore of the cup and having an axial hole threaded for a stem; E is a threaded stem screwed through the piston and continuing upward through and out of the top of the boss of the cap; F is a handle-like head secured to the upper end of the stem; G is a pair of lock-nuts forming an adjustable upwardly-facing shoulder upon the stem; and H is a helical spring surrounding the stem above the lock-nuts, against which its lower end presses, and abutting with its upper end against an internal shoulder at the top of the boss of the cap.

The piston is to be provided with packing, and should so fit the bore of the cup as to prevent the passage by it of the lubricating material below it, and it should be at liberty to reciprocate nicely within the bore of the cup. The stem and piston are capable of a free vertical motion, the stem sliding freely through the top of the boss of the cap, the tendency of the spring being to press the stem downward as far as the head of the stem will permit. The lock-nut may be adjusted upon the stem so as to alter the compression of the spring. If the stem be turned by revolving its head with the fingers, the piston may be adjusted upward or downward upon the stem, the friction of the piston against the walls of the cup being sufficient to prevent the piston from revolving with the stem.

In operation, the cup is unscrewed and removed, carrying with it the stem and piston. The cup is then filled as full as desired with tallow or other lubricating material. The piston is then screwed upward upon the stem as far

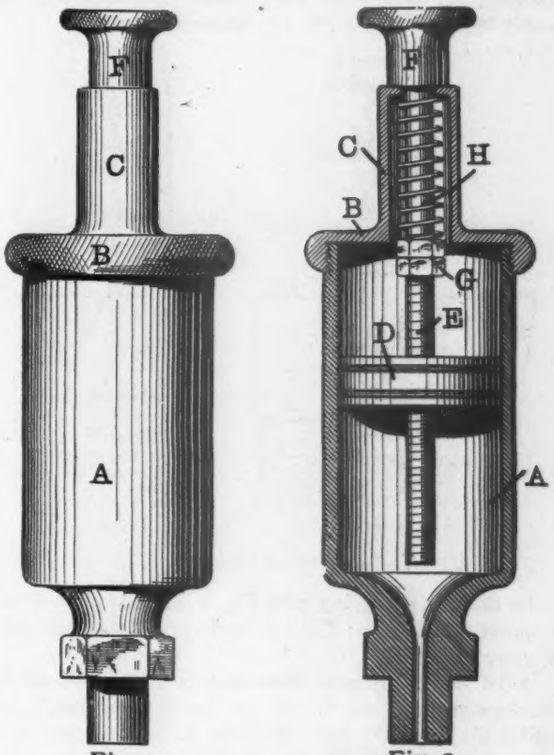


Fig. 1. Fig. 2.

LONG'S LUBRICATOR.

as the lock-nuts will permit, after which the parts are put in place. The head of the stem is then revolved, thus causing the piston to move downward upon the stem. When the piston presses upon the lubricating material, it will not freely move downward any further, and consequently the continued screwing of the stem serves to elevate the stem and compress the spring. In this condition the head of the stem will stand above the boss of the cap, and the piston will be pressed downward upon the lubricating material by the spring. This pressure of the spring serves to expel constantly the lubricating material from the cup, and when the piston is moved downward so far as to exhaust the spring the stem may be screwed upward again, and again compress the spring. In this manner the piston may be moved downward upon the stem at each exhaustion of the spring, and the effect of the spring upon the piston may be at any time adjusted by manipulating the stem so as to compress the spring

more or less, and also while the engine or machinery is in motion, if desired, by holding the hand on one side or the other so the head of stem will strike and turn. The lock-nuts may be adjusted to alter the normal compression of the spring.

It it claimed by the inventor that his device furnishes a simple and effective lubricator, and one that is not liable to derangement.

Anders' Cable-Grip.

DAVID B. ANDERS, of Philadelphia, Pa., is the inventor of an improved cable-grip, which is herewith illustrated and described. The object of the invention is to provide a new and improved cable-grip for cars for the purpose of gripping the cable of cable roads, and which grip can easily be raised out of the way when necessary.

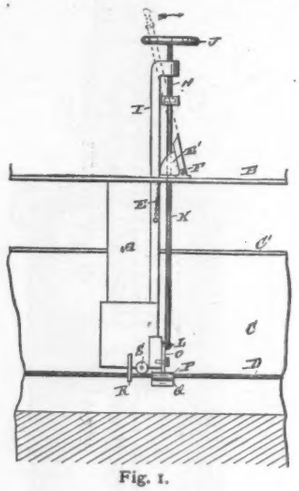


Fig. 1.

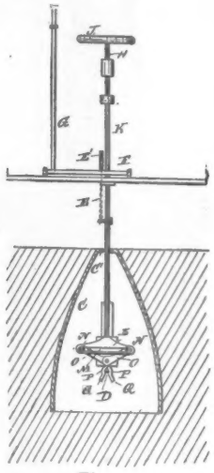


Fig. 2.

ANDERS' CABLE-GRIP.

In the accompanying cuts, Fig. 1 is a side view of the improved cable-grip; Fig. 2 a front view of the same, and Fig. 3 a detail view.

A flat bar A, projects downward from the car-floor B, through the top slot C′, of the tunnel or trough C, in which the cable D, runs. This bar A, is connected by a chain E, or otherwise, with a groove-edged quadrant E′, on a shaft F, journaled on the car-floor and having an upwardly-projecting lever G. An arm I, projects upward from the bar A, and through a nut on the end of the arm I, a screw H, passes, having a hand-wheel J, on its upper

Fig. 3.

ANDERS' CABLE-GRIP.

end, and having its lower end swiveled in the upper end of a rod K, guided in the car-floor and passing downward in front of the edge of the bar A. On the lower end of the rod K, a cross-piece L, is secured, having a slot M, into which pins N, pass, projecting from the upper end parts of two gripping-levers O, which are pivoted to the edge of the bar A, at the bottom, and have gripping-jaws P, below the pivot, from which jaws lugs Q, project downward and from each other. Guide-lugs R, project downward and outward from the lower end of the bar A, and an anti-friction roller S, is journaled on the bottom edge of the bar A, to prevent the lower edge of the bar from sliding on the cable, thus greatly reducing friction.

The operation of the device is as follows: To grip the cable, the screw H, is turned to move the rod K, upward, whereby the jaws P, are pressed firmly against the cable. To release the cable, the rod K, is moved downward. The lugs Q, guide the cable D, in between the jaws P. When the car arrives at a cable-crossing the cable D, is released and the lever G, swung down in the direction of the arrow *a′*, whereby the bar A, is raised by the chain E. When the bar A, is lowered, the lugs R, guide the cable to the lower edge of the bar. Instead of providing the piece L, with the slot M, it may be grooved for receiving the pins N, on the upper ends of the lever O.

The grip is claimed to operate rapidly and grip the cable firmly.

Meigs' Car-Coupling.

CARLOS D. MEIGS, of Ausable Forks, N. Y., is the inventor of an improved automatic car-coupling, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a perspective view of the coupling; Fig. 2 a plan view of the coupling-link; Fig. 3 a sectional view thereof taken on line *x x* of Fig. 2, and Fig. 4 a detail view in perspective of one of the link-sections.

A B represent the draw-heads upon the ends of the cars, these draw-heads consisting of the face-plates *a*, and bars *b c*, to the outer ends of which the plates are con-

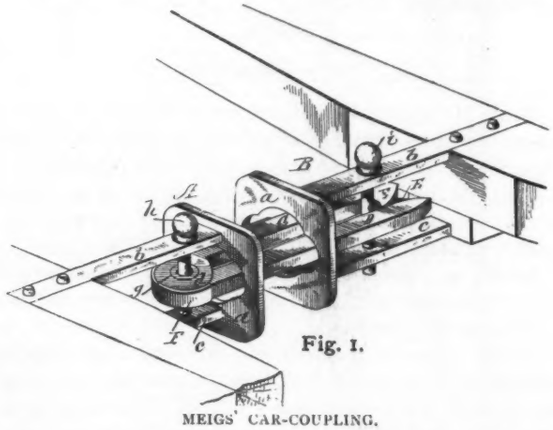


Fig. 1.

MEIGS' CAR-COUPLING.

nected. These skeleton draw-heads form a light and durable substitute for the ordinary draw-heads, but any form of draw-head may be used in connection with this improved coupling-link. This coupling-link consists of two sections or arms C D, each formed with an eye-plate *d*, and segmental shouldered guide *e*. The opposite ends of the link sections or arms C D, terminate in hooks E, of less thickness than the sections or arms, so as to form shoulders *l*, to act as stops for the hooks E, when brought together and upon each other, thereby holding the arms of the link parallel to each other and preventing them from closing too far by the action of the spring. The hooks E, have inclined edges *f*, to form cams to facilitate opening the link when the hooked ends strike the pin in the opposing draw-head. The eye-plates *d*, are pivotally connected together by a short tubular rivet *g*, extending

through the holes in the eye-plates and afterward upsetting each end of the rivet, as more clearly shown in Fig. 3. A flat spring F, is secured at one end to the outer edge of the link-section or arm C, some distance beyond its pivotal point, the spring being curved to embrace the edge of the eye-plates *d*. The opposite end of the spring F, is unattached and perfectly free to move, a shoulder *k*, being formed on the link-section or arm D, against which the free end of the spring abuts when the sections or arms are opened. The pins *h i*, may be of any of the usual forms, and the pin *i*, may have a chain or rope connected to it and extending to the side or top of the car for convenience of withdrawing it in uncoupling the cars.

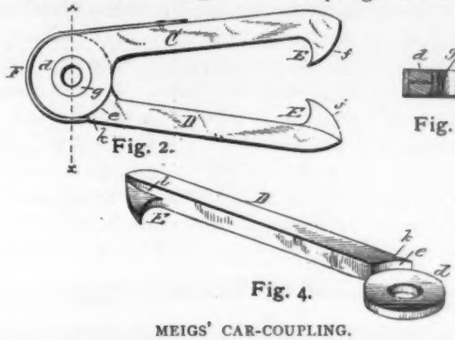


Fig. 2.

Fig. 3.

Fig. 4.

MEIGS' CAR-COUPLING.

The spring F, as heretofore described, is attached to the arms at one end only, the opposite end being free to yield when the link is opened. Thus the full action of the spring is obtained, with no liability of its snapping or breaking, as would be the case were both ends secured.

The inventor claims for his device, simplicity, economy and readiness of adjustment. No structural change is required in the draw-head, and cars employing the coupling can be coupled to those using the old link-and-pin coupling. The device is comprised entirely in the link which can be manufactured at short notice and at small expense. The device has already been subjected to a very satisfactory experimental test.

Bowman's Car-Strap.

EDMUND Q. BOWMAN, of Philadelphia, Pa., is the inventor of an improved car-strap, which is herewith illustrated and described. The general nature of the invention is an extensible car-strap or hold for passengers, principally in street-cars; and its object is to provide such an article that normally hangs suspended at a certain height from the usual rod or other point of support secured on each side of and below the top of the car, but which may be drawn down, against the stress of a suitable spring, so as to serve as a convenient hold for persons of comparatively short stature.

In the accompanying cuts, Fig. 1 is a side elevation showing the strap as extended, and Fig. 2 a longitudinal section through the middle of Fig. 1, with the cord or strap in its normal or retracted position.

A is a handle, preferably of wood, of any desired contour, that shown in the drawing being thought most suitable, as being a convenient form to be grasped by the hand. In this handle a longitudinal hole B, is made, leaving an offset *o*, near the lower end to constitute a support for the end of an open spiral-spring S, which is introduced into the recess. A cord or strap C, is passed within the spring, and attached in any convenient manner to the upper end of the cord is a head or button *d*, that bears upon the upper end of the spring. A neat and simple mode of securing the button to the cord is by means of one or more pins *p*, driven through a hole or holes in the side of the button into the cord. To the lower end of the cord C, is fastened in a like manner—that is, by a pin *p*—a transverse or other convenient handle E, adapted to be grasped by the hand. The vertical handle A, may be suspended from the usual rods or supports *f*, which are secured to the upper sides of the car by means of a buckle-strap *g*, or otherwise. Normally, the handle E, is held up against the part A, by the stress of the spring S; but when the former is grasped by the passenger and drawn down it will be practically extended. In fact, the cord itself, if made long enough to project a

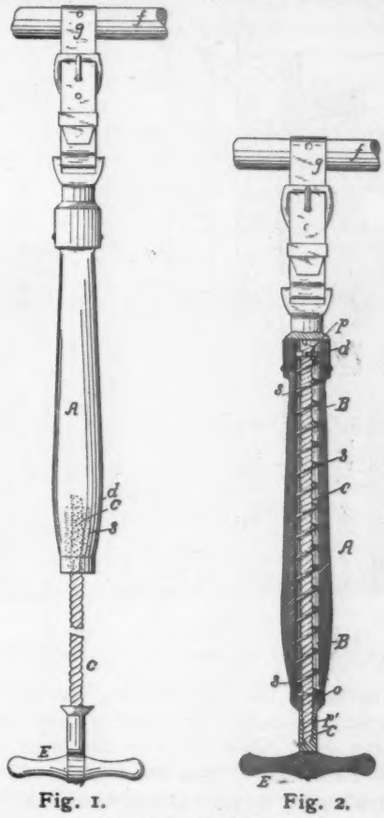


Fig. 1. Fig. 2.

BOWMAN'S CAR-STRAP.

sufficient distance below the part A, will serve as a hold in lieu of the handle. The advantage of having an extensible car-strap is that when not in actual use it remains at such a height above the floor or seats of the car that it will not interfere with the movements of the occupants of the car, yet it may be reached by persons of short stature, and drawn down to a convenient height, the part A, serving also as a hold for tall persons.

It is claimed by the inventor that the use of this device does away with the soiled and unsightly car-straps in ordinary use, and that great additional advantage is secured in the fact that persons of different heights can hold the improved strap with comfort. The inventor is manufacturing the strap and having them made of hard wood, ebonized, with nickel-plated trimmings, in which form they will be ornamental to the car.

Davies' System of Railway Rail-Fastening.

GEN. THOMAS A. DAVIES, of New York City, is the inventor of an improved system of railway rail-fastening, which is herewith illustrated and described. The system consists of a new fish-plate and fulcrum spring or its equivalent spring-washer making, as claimed, a permanent elastic joint; two new forms of spikes to be driven at an angle into the tie; a stay-plate driven back of the spike across the grain of the wood, and a center fastening for the rail and metallic friction-plates to prevent the rail from cutting the tie. The device is protected by eight patents, and its various parts will be described separately.

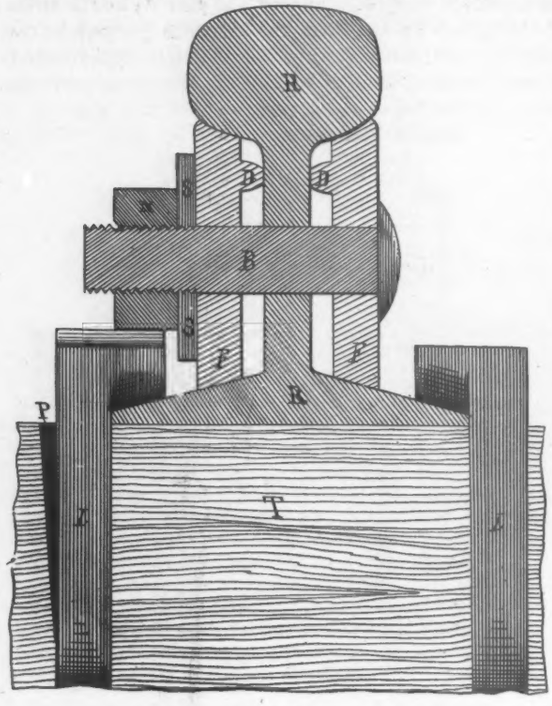


Fig. 1.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

Fig. 1 represents the three-bearing fish-plates; F F represents the cross-section of a pair of these fish-plates. They are the strap fish-plates with the usual holes for bolts, with a rib drawn upon the upper inside face to insure a firm bearing on each side of the web of the rails, and also a bearing upon the upper and lower bevels of the rails. These plates are to be drawn out to fit in this manner any sized rail. The plates with their bearings are kept continually in their places by the ordinary nuts and bolts acting upon powerful fulcrum-springs, or metallic spring-washers, as will hereafter be described. It is claimed that there will be no wear to these plates if the bearings are kept up continually, because there is nothing that can give, and hence no wear. It is the keeping up of these bearings that is the essence of the device and makes the joint perpetual.

Fig. 2 relates to the powerful fulcrum-spring. This spring is represented in full size and shape, and it is made of the best spring steel tempered $\frac{3}{16}$ inch thick, 2¼ inches wide and 1½ inches longer than the distance between the centers of the bolts over which it operates by means of slots in the ends of the spring. The two arms of the spring from the center are made straight. The spring has a recoil to each end of ⅜ inch and, as near as experiment could prove, has a recoil power equal to one ton weight on account of its shortness.

To make the joint, the fish-plates are set in at the top and then their bottom slid on the lower bevel until the three bearings are attained. The bolts are then inserted in the usual way, and the springs are put over the bolts, the bolts protuding through the slots in the springs with the angles of the springs resting against the fish-plate. The nuts are then screwed on and this is continued until the ends of the springs touch the fish-plates. The bolts and fish-plates are then smartly hammered up to their bearings and if the ends of the springs are then away from the fish-plates, the nuts are screwed up again until the ends of the springs just touch the plate. A center punch is then taken and the point placed on the angle between the nut and the screw. It is given two or three raps of a hammer on the punch which will destroy the continuity of the thread of the screw but will not injure the screw. If the nut is required to be taken off, a wrench applied to the nut will recut the thread and the screw be as good as new. The joint is then complete, In Fig. 1, F F are the

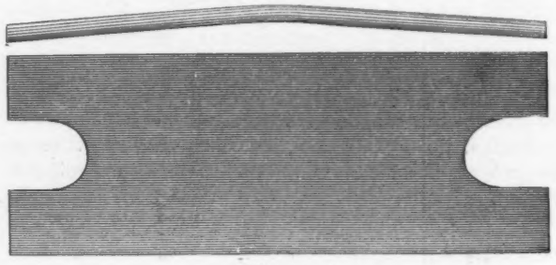


Fig. 2.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

fish-plates, S the springs, B the bolts, N the nuts, R the rail, and T the tie. It is claimed that there will be about two tons pressure on both plates to keep them to their bearings; while the bolts will never break unless they are defective, for they are held by the elastic springs which will give and take to any contraction or expansion or any sudden force. It is also claimed that these plates, springs and bolts, from experiments made, will never wear and will remain as they are put during the life of the rail. If, however, some wear does take place between the rail and the fish-plates, the springs will take it up and the bearings will still be continued and maintained.

The inventor gives the following result of an experimental test of these joints and his deductions therefrom:

"These joints have been in use in the Grand Union Depot and New York Central yard for eighteen months where the wear is estimated to be equal to twelve times the wear on the main line outside. So that they have had a wear equal to eighteen years on the main line of the New York Central, a road doing an immense traffic second to none in the country. The joints have never been touched or repaired, nor a nut tightened, nor a bolt broken, and they are as rigid and strong and perfect to-day as they were the day they were made, while every other joint in the yard, made with the most approved forms of fish-plates, has undergone repairs from broken bolts, or has been tightened by screwing up the nuts time and again.

"The joint has, therefore, well earned its name of the perpetual elastic joint which makes the continuous rail long sought for, but never before attained. This insures pleasant riding and will do away with the "click-a-ti-click" so annoying to travelers, resulting from imperfect and yielding joints. To the railway investor the imperfect joint is the thief of his profits, while a perfect joint and rigidly held rail to the ties reduces all wear of track and rolling-stock to the minimum."

Another peculiarity of the device is the oblique-headed spike. To all observers it is well known that however good a bearing against the rail the common railway spike may have when it is first driven perpendicularly into the tie, it takes but a few trains over the road to draw the

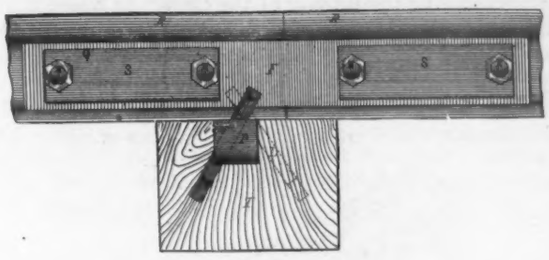


Fig. 3.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

spikes upward slightly, and the surging of the engines and cars sideways will slightly crush the wood fibre of the tie behind the spikes sufficient to leave the rail free from the spikes. The oblique-headed spike, here shown, has the same body as the common spike and the head is the same. It is made, however, with the head inclined to the body (see L, in Fig. 4), and when driven at an angle of about forty degrees from a perpendicular, the head will have the same bearing on the flange of the rail as the straight spike. This spike, it is claimed, can never be drawn from its place by any upward motion of the rail and is strong enough to hold the tie to the rail under any circumstances.

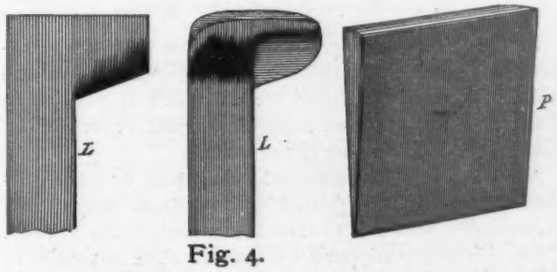


Fig. 4.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

The inventor gives the following as the defects of the old system of rail-fastenings and the benefits of the new, as substantially set forth in the patent specifications:

"The spikes may remain in place, but the rail is free to move within the end fastenings of the rail, and also to the right and left; all of which motions are at first small but sufficient to do great mischief to the tie, and sometimes to the spike, resulting in the spreading apart of the rails, when damage and accidents ensue. These are not common on well-constructed roads, but on any road, if the spikes are loose on the inside of the rail, the rail may roll and produce the same results. In this view the spike is a very important factor in railroading and important to be so made and driven that it cannot be drawn by any upward motion of the rail, or the fibres of the wood tie be crushed behind the spike. As soon as the spikes become even slightly loosened the rail, as before stated, can move slightly on the wood of the tie in any direction, and the sand getting in between the tie and the rail will perform the same duty in cutting away the tie that the saw does in cutting stone when fed with sand and water. Comparatively few ties last until decay ends their usefulness—they are mostly cut out and destroyed by the ever-running rail-saw. The oblique-headed spike driven into the tie at an angle from a perpendicular of forty degrees will effectually prevent the rail from ever drawing the spike by any upward motion of the rail.

"This, however, is meeting but one phase of the trouble. The most important point is to keep the rail from moving endwise or laterally and then get such a bearing on the tie that it will not cut, and then every difficulty is solved. The rail will then be held in place so that it can do no damage and is safe in these respects against injury or accident. In order that the spike shall not cripple the

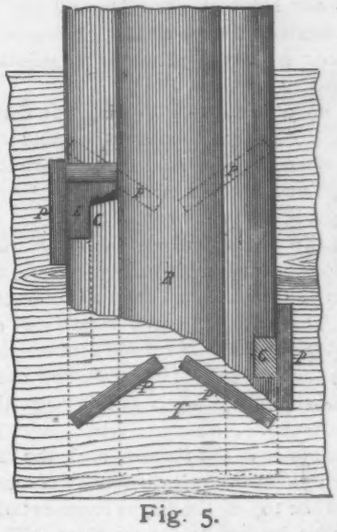


Fig. 5.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

wood fibre of the tie, a spike stay-plate has been invented; this will prevent the side motion of the rail. To prevent the end motion the center fastening of the rail is used. To prevent the cutting of the tie by the rail, friction-plates driven into the tie under the rail are used."

L L, in Fig. 4, refer to the conical and square-head spike. This form of spike differs from the oblique-head spike in that it can be used to be driven perpendicular into the tie or at any assumed angle right or left, and still have a complete yet the same bearing upon the incline of the lower level of the rail. The lower or contact surface of the head is made in the shape of the frustum of a cone which will fit the surface of the lower bevel of the rail no matter at what angle it may be driven into the tie. It is claimed that it is stronger in the head for the same amount of metal used than any other form of spike made with a head to be drawn out by a spike crow-bar.

The spike stay-plate is an iron wedge about two inches square, one-quarter inch at the top and sharp at the bot-

tom, and is represented in Fig. 1 back of the spike driven into the tie. It is also represented at P, in Fig. 3; in Fig. 5, and in full at P, in Fig. 4.

This plate is first driven into the tie the width of the body of the spike from the rail across the grain of the wood; then the spike is driven at an angle of about forty degrees from a perpendicular between the rail and the plate. These plates are intended to be used on the outside of straight tracks, one to each second tie, also on the outside of gentle curves one to each tie, and on sharp curves two spikes and two stay-plates to each tie. These stay-plates reinforce the fibre of the wood so that no movement of the rail, it is claimed, can take place outward.

Fig. 5 represents the center fastening. The rail-clips are made in the rail at *c c*, the depth of the width of the body of the spike, not opposite each other but to the right and left of the center of the ties. The stay-plates are then driven into the tie snug to the rail and opposite the clips, and left to project one-quarter inch above the ties. The clips are three-quarters of an inch long and one-half inch deep. The two spikes, either oblique-headed or conical-headed, are started into each clip and both spikes driven at the same time at such an angle that the spikes will bind on the sides of the clips and the stay-plates when driven home to their places.

The inventor gives the following as substantially set forth in the patent specifications:

"There is an objection to clipping the flanges of the steel-rail and, *per se*, that objection is sound where nothing is to be gained by doing so. But if there is a valuable object to be gained, and the gain is worth more than any risk of danger, it is equally sound to do it. But if it is seen that the clip which weakens the rail in fact, though practicably does not injure its utility, is made up by reinforcing its strength at the clip, then the objection falls to the ground. This arrangement of spikes and stay-plates with the solid bearing on the tie and friction-plates in the tie, reinforces the strength of the rail, and the rail thus reinforced is absolutely stronger at this point than at any point not reinforced."

The friction-plates in the tie are simply the inexpensive stay-plates driven into the tie diagonally across its grain and level with the top of the tie, as represented in Fig. 5, where the rail is broken to expose them. The rail will then have a full bearing on the wood and on the top of the stay-plates and, it is claimed, the stay-plates will prevent any wearing of the wood of the ties.

By these devices, it is claimed, the rail will be held firmly to its place on the ties; that the rail acting as a saw will no longer do its mischief; that the perpetual elastic joint will give the continuous smooth rail, and that the new system of fastenings will save expense in wear and tear of track and rolling-stock equal to a small dividend on the stock of any road as against the expense of repairs of the present old system. It is also claimed that the cost of new work under the new system, including a small royalty to the patentee, will not exceed the corresponding cost under the old system. The present old system can be altered to the new by a small expense compared with the benefits to be derived therefrom.

Further information concerning the system can be obtained from Eliphalet Wood, manager of the Walter A. Wood Mowing and Reaping Machine Company, 191 Fulton street, New York City.

Sprague's Railway-Station Signal.

ARTHUR A. SPRAGUE, of San Rafael, Cal., has recently invented an improved signal for railway-stations, which is herewith illustrated and described. The device is designed to serve as a day and night signal, station-sign and light, and it consists of a case supported upon an arm which projects from the side of the station-building, or other convenient point, one end of the case being formed with opaque sides and the other end having transparent glasses in the sides, so that a light which is set within that end may be seen from both sides and the end. The opposite end contains a frame-work having colored glasses or lenses set therein, and this is operated by a mechanism connected with the interior of the office. In connection with this lamp, similarly-colored signal-boards or targets are employed, which are also connected with the same operating mechanism so that they will be moved in conjunction with the lenses. The colored lenses and colored boards when not in use are kept entirely out of sight.

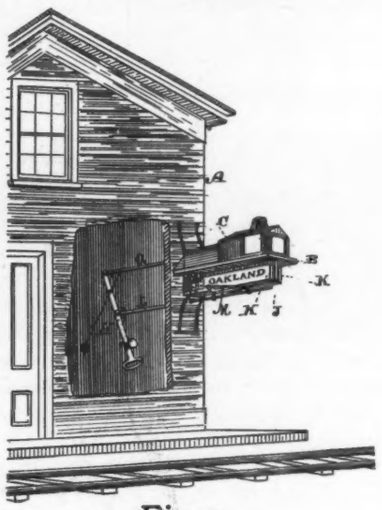


Fig. 1.

SPRAGUE'S RAILWAY-STATION SIGNAL.

In the accompanying cuts, Fig. 1 is a view of the apparatus, showing the signal in a position to allow the train to pass; Fig. 2 shows the apparatus in position to stop a train; Fig. 3 is an enlarged perspective view of the device, and Fig. 4 a plan of the same.

A is the side of the station-house, a post or other suitable structure from a projecting arm B, and may extend horizontally outward toward the track of the railway. Upon this arm is supported a case C. The outer end of this case has open sides with transparent glasses fixed in them, and a lamp D, may be placed in this portion of the case, so that its light can be seen along the line of the track from either direction, and it may also be seen from the end of the case, which is also glazed. The end may be in the form of a hinged door, which can be opened for the ready inspection and adjustment of the lamp within. The opposite end of the box or case C, has close opaque sides and ends, as shown.

Within the box, a frame-work E, is fitted to travel freely, so that it may be moved from end to end of the box. It is preferably mounted upon small wheels or rollers, so as to travel easily, and it has fixed in its sides

two colored glasses or lenses, so that when this traveling frame is moved forward it passes upon each side of the stationary lamp, and the lenses cover the white glass from the interior, so that the only light seen will be colored. This frame-work with its lenses is caused to travel back and forth within the lamp-case by means of a rod or arm G, which connects with the upper end of a lever H, fulcrumed to some convenient point within the station-building, preferably within reach of the station-agent or telegraph operator.

The lower end of the lever may have a disk or target attached to it, and the wall along which it moves has two circular knobs I, formed upon it, one being white and corresponding with the white glass in the lamp-box, and the other being colored to correspond with the movable lenses. When the lever is moved so that the disk upon its lower end stands against the white knob, it will show that the white light is exposed and the colored lenses concealed. When the lever is moved so that the disk stands against or over the colored knob, it will indicate that the colored lenses have been moved forward so that the colored light is thrown along the line of the track.

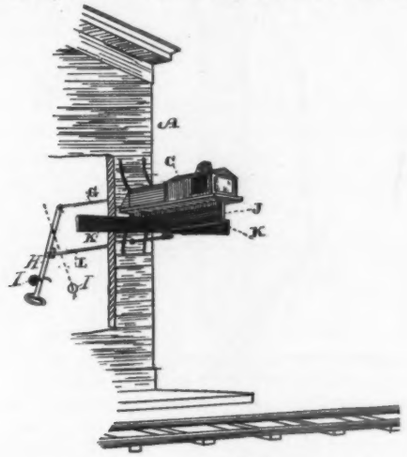


Fig. 2.

SPRAGUE'S RAILWAY-STATION SIGNAL.

In order to provide a corresponding daylight-signal, a board J, of sufficient width, projects below the arm which supports the lamp-case, and this board is painted the same color as the lenses. Upon each side of this board another board K, is hinged, so that they may be opened outwardly from it in each direction, and stand at right angles with it; or they may be closed together so as to cover it entirely. The outer faces of these hinged boards are painted white, and may have the station name upon them if desired. The inner faces are painted of the same color as the station-signal. In order to operate these hinged wings, a rod L, is connected with the lever H, inside the station-house below the fulcrum, and extends out horizontally beneath the colored signal-board, having suitable guides within which it moves so as to keep it in proper line. To this rod the inner side of two other rods M, are pivoted or hinged, while their outer or opposite ends are pivoted to the hinged wings or boards near their hinges. From this construction it will be seen that when the lever is moved so as to push the rod outward, the hinged wings will be closed against each side of the colored signal-board so as to cover and conceal it entirely, and when the rod is drawn back it operates through connecting-rods M, to swing the wings back until they stand at right angles with the signal-board or target. The movement of these wings is simultaneous and corresponding with that of the colored lenses in the lamp-case, so that when the lenses are projected forward to produce a colored light the wings will be swung outward so as to

Fig. 3.

SPRAGUE'S RAILWAY-STATION SIGNAL.

expose the signal board or target, and when the lenses are withdrawn so as to expose the white light, the hinged wings will be closed upon the colored signal-board or target so as to entirely conceal it and leave their white outer sides exposed to correspond with the white light which will be exposed in the lamp-case.

By this construction the mechanism which is necessary for operating the station-signal is simplified, no gears, weights, or springs are necessary, and the operation of

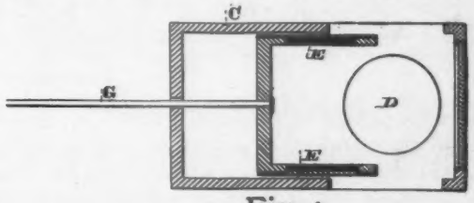


Fig. 4.

SPRAGUE'S RAILWAY-STATION SIGNAL.

the whole device is positive, while the exact position of the parts is indicated by the glasses at the lever by which they are operated within the office. In this device only one signal can be seen at one time, the other being entirely covered and concealed, and by moving the lenses inside of the lamp-case they will never be affected by snow or sleet so as to render them dim.

The signal is now in practical use on the North Pacific Coast Railroad, where it is giving satisfaction.

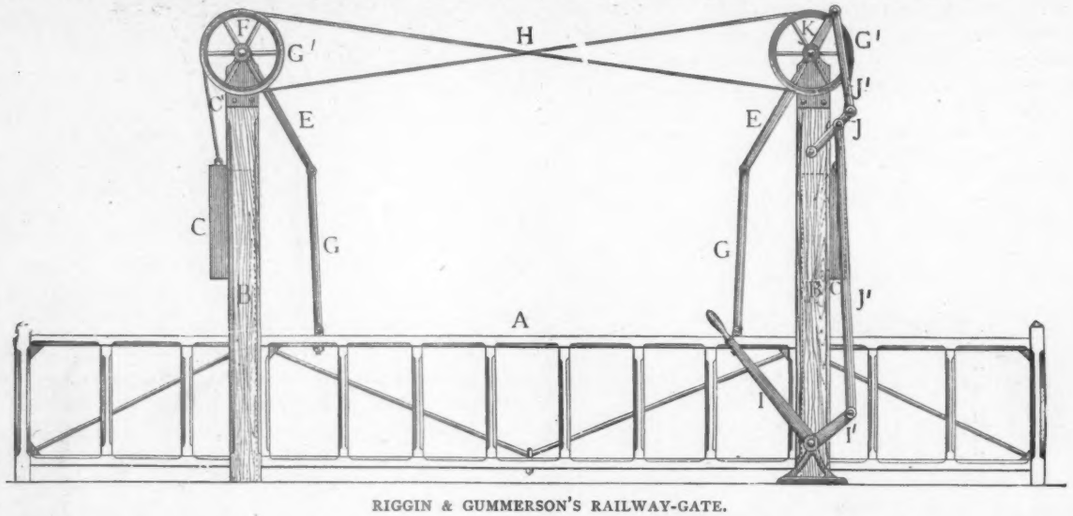
Riggin & Gummerson's Railway Gate.

CORNELIUS S. RIGGIN and ALBERT E. GUMMERSON, of Newark, N. J., are the inventors of an improved railway gate for grade-crossings, which is herewith illustrated and described. This invention consists in the combination, with the gate, of oscillating arms mounted upon shafts above the opposite ends of the gate, connections from the arms to the gate, pulleys connected with the arms to

actuate them simultaneously, crossed ropes applied to the pulleys to operate them in different directions, a hand-lever, and a connection from the hand-lever to the pulleys for oscillating the pulleys by the vibrations of the lever; and it also consists in a modification thereof, including counterbalance weights.

The accompanying cut is an elevation of the gate having the hand-lever connected with the vibrating arms and wheels by rods and cranks.

A is the gate, fitted to slide between posts B, and E are the lifting-arms secured upon shafts F, at the tops of the posts B. These arms are coupled to the gate by links G, and are secured to the shaft F, so as to turn with the pulleys G′, the pulleys being so connected as to turn in opposite directions by means of crossed ropes H, which have their ends securely attached to the rims of the pulleys. The arms both point in toward the middle of the gate, and serve to raise the ends of the gate equally when



RIGGIN & GUMMERSON'S RAILWAY-GATE.

either of the pulleys G′, is rotated a sufficient distance, as one-third or one-fourth of a circle, depending upon the length of the arms E, and the rise required for the gate. A rise of sixteen feet or more, as required, can be given. The gate extends, as shown, through the posts and across the side-walks on either side, thus affording protection to pedestrians as well as to those in vehicles.

The gates are counterbalanced by weights C, which are hung to cords C′, attached to the rims of the pulleys G′, so as to be lowered or raised when the gate is raised or lowered by means of the pulleys G′. I is the hand-lever, I′ a crank affixed thereto, and J a multiplying-lever above the lever I, upon the post B. J′ are rods connecting the crank I′ with the lever J, and with a crank K, affixed to the upper pulley, G′, so that the vibration of the hand-lever produces the required oscillation of the pulley G′, and arm E, by a single movement on the part of the operator. By the balancing of the gate and the connection of the lifting-arm with the hand-lever I, in the manner described, the desired movement in the gate is effected very rapidly and easily.

From the above it will be seen that the combination of the arms E, with the pulleys G′, connected together by the cable or ropes H, so as to turn simultaneously, affords a means of raising the two ends of the gate by a partial rotation of the pulleys G′, and thus enables the gate to be operated by a single movement of a hand-lever.

The posts B, are capped at the top to hold them securely together, these caps also serving as a box to hold the shaft. The posts may be made of either wood or iron, as desired. In the former case they would be 8 × 12 inches in size, and in the latter commensurably smaller. The gates may also be constructed of either wood or iron, but the former material is equally efficient and at the same time lighter and more inexpensive.

The gates are supplied with an alarm bell, operating automatically, and the entire mechanism of the gates is above ground, being thus absolutely free from obstruction by snow, ice and frost during the winter months.

The gates may also be operated with link-belting and sprocket-wheels or chain and ropes, with proper gearing in either case to be controlled by a crank.

The inventors claim that their device provides a simple, durable and inexpensive gate for grade-crossings, that in its use perfect protection is assured to life and property, and that, being counterbalanced by weights, the gate can be raised and lowered with the slightest exertion on the part of the operator.

On one of the Russian railways the practice has for some time been in vogue of heating the tires for the wheels by immersion in hot water, instead of by fire, before shrinking on the wheels. Near a boiler stands an iron vessel of water, which is heated to 100° centigrade with the steam; in this the tires are immersed for ten or fifteen minutes, then raised by a crane and brought on the body of the wheel. For this operation three workmen are required, and in eleven hours from twelve to fourteen tires are thus treated, and the difference of diameter is three-fourths mm. for every millimetre. It is said that this mode of heating insures, on the whole, a greater degree of regularity. According to observations made on the railway in question, 37 per cent. of the tires shrunk on by the old method came off, and 5 per cent. were broken in six years; while in the case of the water-heated tires the loosening showed less than 1 per cent. in three years, and with only one tire broken.

GENERAL OFFICES **THE ROTE AUTOMATIC BRAKE COMPANY,**

MANSFIELD, OHIO, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake*. This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner*, so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like peope everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, President.

THE AMERICAN RAILROAD JOURNAL

JANUARY, 1886.

American Railroad Journal,

A MONTHLY MAGAZINE AND REVIEW.

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